COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

New York, April, 1935

Your Voice

WASHINGTON today is actively considering legislation which will leave its impress upon business for years to come. Yet, except in the case of measures, such as the Guffey bill, applying solely to a specific industry, business men in the mass avoid personal appearance and personal contact to make their position known to their representatives in Congress. A handful of volunteers and association officials are left to combat the demands of vociferous and well-organized minorities. Volunteer and conscript commanders may increase the time the average business man can devote to the immediate details of his individual enterprise, but generals without armies win few battles. And Congress cannot be blamed if it interprets silence as lack of interest.

Rock-Dusting

ROCK-DUSTING was decreasing at the time of the last reported inquiry by five separate counts—percentage of mines using it, percentage of total production from mines in which it is used, percentage of total underground employees in such mines, percentage of total underground man-hours in rock-dusted mines, and in pounds of rock dust applied in the mines in which it is used. This announcement surely will be disturbing to everyone who hopes for the eventual elimination of coal-dust explosions.

No one can feel assured that the decrease of coal-dust explosions is due solely to human provisions against such catastrophes. The immunity may largely be due to favoring atmospheric conditions. Winters such as we have had, with snow lying on the ground to maintain air saturation, may have more to do with immunity from explosions than the average manager assumes. Cold, dry nights with no rime frosts are the most greatly to be feared, and recent winters have been free from such cloudless, starlit periods. As weather occurs in cycles dependent apparently on sun-spot frequency, cold, dry nights may be anticipated in future years, and too much faith cannot be placed on this immunity.

Vigilance, therefore, should not be relaxed. Especially should returns and untraveled roadways be rock-dusted. Return airways receive all the fine dust from mining operations and, though more carbon dioxide is present, there also is more methane; hence, airways are more likely to be ravaged by an explosion than motor roads. Moreover, too often they are less carefully inspected and less uniformly and less frequently rock-dusted.

Colloidal Fuel

POSSIBLY the manufacture of real colloidal fuel from coal and oil will never be a commercial success, even for use in countries remote from oil supplies and having plenteous coal resources, because of the cost of reducing coal to a colloidal state. Some of the coal will be rendered fine enough for colloidal suspension by ball, roll or impact mills, but most of it will still be so coarse as to settle. In grinding coal in air to colloidal fineness, as in a Plauson mill, extensive oxidation is inevitable, making the coal act like an earth during flotation. The

formation of colloidal fuel has much in common with the flotation process, and perhaps a flotation reagent and grinding in an inert gas may some day make it possible to float coal satisfactorily in natural or tar oils without using any high degree of pulverization.

New light on the colloidal process is likely to be attained by likening peptizers, or deflocculents, to flotation reagents, for the peptizers used in the manufacture of colloidal fuel are identical with those employed in Germany to aid flotation. Their acidity doubtless aids in deflocculation and, therefore, in floating the coal, for it has been found that sludge can be prevented from settling by making it acid.

Perhaps succinic acid may be found to be the flotation agent desired. It may not be made, as in Germany, from waste amber; the small quantity of such waste material would preclude it from so large a purpose. But perhaps it could be made from turpentine or from lignite or coals in which it or resin occurs, or from the action of nitric acid on organic substances. Coating the coal with the peptizer, or flotation reagent, prior to mixing may materially assist in promoting intimate contact with the suspended solid, increasing its effectiveness and economizing its use. The subject is intriguing, and perhaps it has not yet been attacked from the right angle.

Missing

AS THESE LINES are written, the question whether there will be a nation-wide suspension of bituminous mining on April 1 still rests on the knees of the gods—and Mr. Lewis. Certainly the demands made by the United Mine Workers for further increases in wages and still shorter hours cannot be expected to improve the competitive position of the coal industry unless their acceptance should lead to still greater unit efficiency. Desirable as such an outcome might be from the standpoint of management, it hardly would achieve the confessed union objective of augmenting employment opportunities for its members.

But there is one collateral aspect of the situation which may be discussed without regard to the uncertainties of the Washington wage negotiations. That aspect is the implied relationship between a suspension or strike and enactment of legislation such as proposed in the Guffey bill. Some of the union statements in support of that measure, at least by juxtaposition, seem designed to create the impression that the absence of such legislation makes a suspension more imminent.

Coldly examined, however, this subtle pleading serves only to emphasize the fact that the Guffey bill in its present form offers no protection either to the public or to the mine owners against a recurrence of the frequent strikes which proved so disastrous in the past to the industry and to the mine workers. If management is to be bound by government regulation and if union labor is to be given statutory seats on the control councils and commissions, is it unfair to ask that labor too shall submit to some restraints on its freedom of action comparable with those management must accept?

Threatened Men

A WELL-RECOGNIZED adage declares that "threatened men live long." In a mine where men are examined for their defects they know when their condition threatens their lives or their working ability. If they are ruptured, they get trusses or undergo an operation and take care not to perform those operations which exceed their strength, or to perform them in such manner as not to cause overstrain. If their sight is defective, they purchase corrective goggles and may become more satisfactory workers than men who do not have them. Other corrective treatment is available for men with other ailments. This fact alone justifies the examination of all employees.

In mines with bad roof and other hazards, the knowledge that men are threatened produces a similar protective treatment, so that the condition can be remedied, making such dangerous mines and hazardous conditions less risky. A recognition of the condition and the ascertainment and application of the cure may make the mine and the job as safe as if normal. But the hazard must be ascertained. Many jobs and practices are rated as not particularly hazardous because there are few accidents. Study of the number of casualties in connection with the number of men exposed to the hazard might throw a different light on the subject. With care, men hampered by defects or subject to peculiar hazards may live long and be as free of accident as other men.

CONVEYOR MINING

+ Brings New Lease of Life

To Southern Appalachian Mine

By J. H. EDWARDS
Associate Editor, Coal Age

OF THE SEVERAL conveyor-mining installations made during the past two years in southern Appalachian fields, that of the Leckie Collieries Co., Aflex, Ky., is cited as one of the most successful from every standpoint. A mine which was struggling against more stringent demands for quality has been given a new lease of life. Conveyor mining has not only boosted the quality index of the coal in its old domestic and steam markets but it has gone beyond that and stepped the coal up into the by-product market. Operating difficulties or penalties commonly considered existent in working but 30 in. of a 50-in. bed have proved a myth. Officials of the company attribute the satisfactory operation of their conveyor mining to successful control of the roof and to the employment of a working cycle free of operating delays.

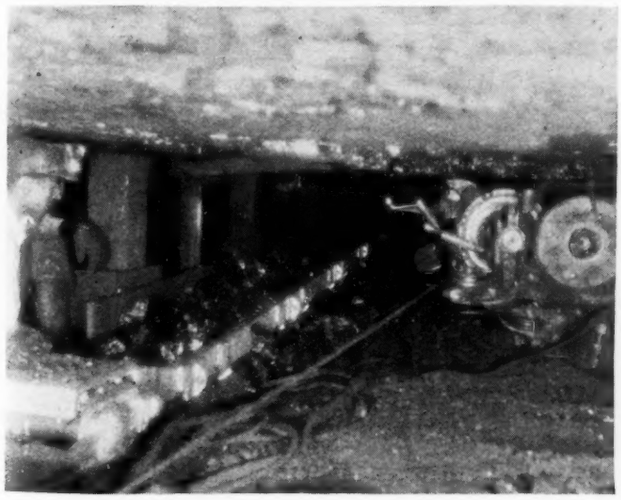
The mine is located close to Tug River about two miles upstream from Williamson, W. Va., but on the opposite, or Kentucky, side. Workings are in the Pond Creek seam and the drift opening is at tipple height. The operation dates from 1916, but the tipple, a steel structure, is equipped with modern picking and screening facilities. Shipment is via a spur track of the Norfolk & Western Ry. which joins the main line at Williamson. Conveyor mining is going on in both fee and leased tracts.

Until October, 1933, when conveyor mining was begun, the usual room-and-pillar method of extraction was employed and the development was kept far ahead of immediate needs. One of the principal difficulties of mining was the separation and gobbing of an 8-in. band of 35-per-cent-ash bone occurring 32 to 34 in. above the bottom. Another was that the 4- to 5-in. seam of coal above this band contains as much as 15 per cent ash and was mixed with the 32- to 34-in. bottom bench which contains less than 4 per cent ash. Draw rock 2 to 8 in. thick below the hard slate top had to be posted or taken down and handled, and in either case increased the ash in the coal, especially in the slack.

Favorable mining conditions include a hard slate bottom, practical absence of explosive gas, a level seam devoid of rolls, and freedom from water which would introduce disagreeable working conditions, especially for men who must sit on the mine bottom or be on their knees for shoveling in thin coal. Above the draw rock there is approximately 14 ft. of hard slate and over that a strong, thick sand rock.

Market advantages of a change in mining methods to take only the low-ash bench were obvious, and conveyors offered the only means of bringing the coal to the room entry without dead-work. An opportunity was presented to mine a superior vein of clean coal without including the top coal of lower grade and without admixture with impurities from floor or roof or both. Because the coal is very friable and at best produces but a small percentage

Tail End of Face Conveyor Showing Sideboard and Safety Posts. At Right Hand, Mining Machine Has Started the Cut.



Room Heading Showing Bone, Top Coal and Draw Rock Above Room (Left) Mined by Conveyors in Bottom Seam.

of lump, any change in quantity by reason of conveyor mining would make but little difference. Ash in conveyor-mined slack, machine cuttings included, runs less than 4 per cent, as compared to about 7 per cent in the slack from full-seam mining.

Present equipment comprises two conveyor units, each consisting of a 180-ft. room or lateral conveyor and a 76-ft. face conveyor, both of the single-chain drag-flight type. Rooms are driven on 95-ft. centers 90 ft. wide and 190 ft. deep, and are started at full width, without necks. Progress of mining the successive rooms of a panel is outbye and the room heading track is removed as the panel is mined. Sufficient empty track for fifteen mine cars, or about 175 ft., is maintained back of the room-conveyor loading head. Up to the present the two conveyor units have not been operated in the same panel.

Conveyor sections are worked double-shift and a room is completed in about 24 shifts. Usually the room caves within two weeks after completion, but at times as many as two or three rooms back of the working room remain open. Even in these cases no weight becomes evident at the working face and the coal seldom breaks down of its own accord after being undercut. Room posts are not pulled or shot to encourage caving.

A conveyor unit crew consists of eight men who do all work including operation of the cable-reel locomotive which handles trips between loading head and parting. Tracks are arranged so that this haul is not over 1,000 ft. A crew averages 70 tons per shift, conveyor movings excluded, and 65 tons per shift, movings included. Two units produce 5,000 tons per month. The coal is prepared and loaded separately at the tipple by a night shift in order to avoid any mixing with the product from other mining.

The crew are paid day rates, which are as follows: crew leader, $5.60; two machine men, $4.76 each; and five other men, $4.60 each. Time of the machine men is practically all taken up by cutting, drilling, loading and shooting; and the crew leader works at the various other jobs as occasion demands. Preference to any particular nationality of worker is not shown in selecting men for conveyor crews.

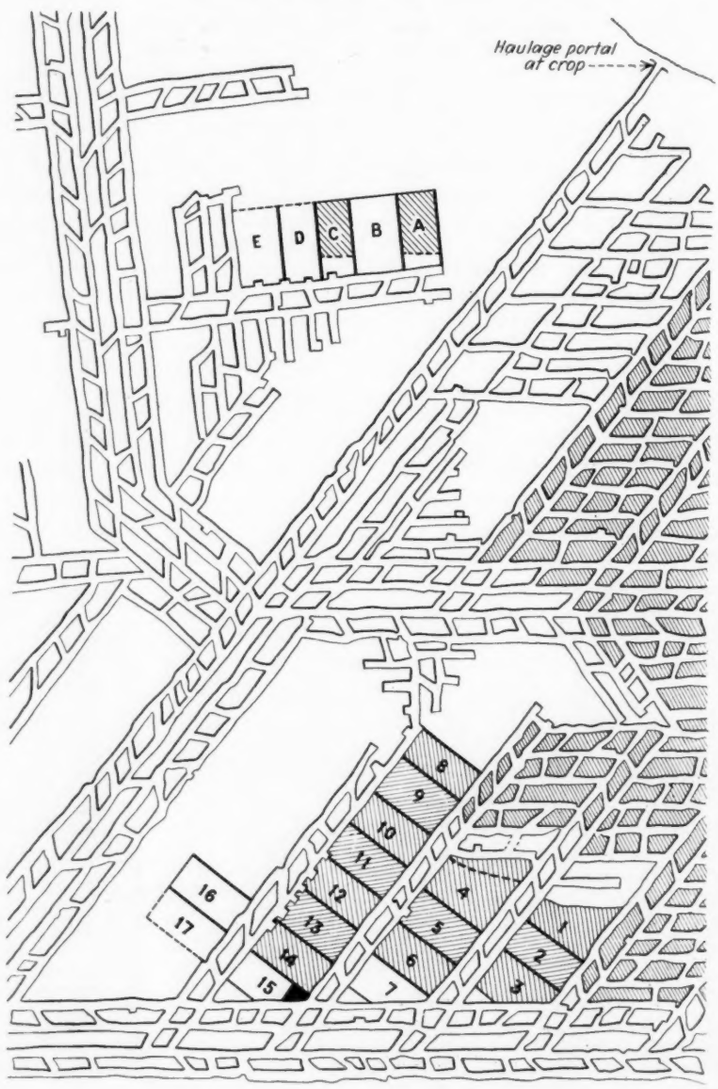
One unit of the equipment consists of a Jeffrey 61-AM lateral conveyor and a 61-HG face conveyor with chain speeds of 90 ft. per minute. Pan sections are 6 ft. long and have flanges for bolted joints. Drives are Westinghouse Type SK 275-volt 1,750-r.p.m. compound-wound d.c. motors connected through reducers made by the Cleveland Worm Gear Co. Motor sizes are 10 hp. on the lateral conveyor and 5 hp. on the face conveyor. Control wiring is arranged so that both conveyors can be started from a control point at the loading head and so that either can be started independently from control stations at each motor. Two Ladel conveyors of the same general design and dimensions and operating at 80 ft. per minute make up the other conveyor-mining unit. Drive motors are similar to those of the Jeffrey equipment except that a 7½-hp. motor is employed in the operation of the Ladel lateral conveyor.

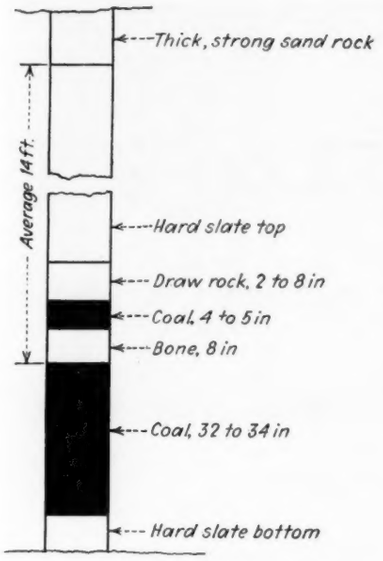
Face conveyor pans of both makes are without the flaring sides that are integral parts of the room conveyors. Both makes of face conveyors are fitted on both sides with clips accommodating 6-in. removable side boards. These are used on the side farthest from the face and afford a backstop for shoveling. The clips on the opposite side come into play if the conveyor unit is installed for working rooms on the opposite side of the entry.

Rooms are ventilated by Jeffrey blowers, one for each unit and located beside the loading head on the room entry. Each blower is powered by a 2-hp., 1,750-r.p.m. motor. Ventube installed parallel to the room conveyor and extended as work progresses conducts air to the face. Drilling for one unit is done with a Jeffrey Type A-7, 38-lb. permissible electric hand drill driven by a 1½-hp. motor; the other drill is a Little Giant electric, Style 473, Type PM.

At the time this study was made shortwall mining machines were being used for both units; one machine is only 16 in. high and cuts on the bottom; the second machine—an older type—proved too high for convenient operation in the seam and could not cut closer than 4 in. to the bottom. Scrapping is not economical practice with conveyor work, hence this bottom coal is lost. This latter machine was soon to be replaced with a longwall type having pushbutton electrical control with contactors mounted on a skid that is dragged back of the machine. This will

Portion of Mine Map Showing Conveyor Sections.





Section of Seam and Immediate Top.

cut on the bottom and has the advantage of requiring less open space between conveyor and face. Because the mine bottom is a hard material which will dull bits quickly there is no difficulty in persuading the machine operator to keep the bits out of the bottom; the difficulty is to keep the cutting close enough to the bottom to avoid waste of coal.

Posting of rooms is varied somewhat to suit roof conditions. Only in a few instances are posts set temporarily between conveyor and face. The regular method consists of setting back of the conveyor two rows of split timbers per 6-ft. cut, usually on 3-ft. centers but at times varied so that the minimum protection is the equivalent of posts on 4-ft. centers each way. Split posts cost approximately 4c. each delivered to the working place. Conveyor motors are reversed to carry posts and other materials to the face of the room.

A row of emergency posts set against the back side of the face conveyor and moved forward whenever the conveyor at that point is pushed forward has proved a worth-while practice. But little work is involved in moving these emergency posts because they are not wedged and usually they clear the roof. In one room the face conveyor and a portion of the room conveyor were covered by a fall approximately 50 ft. in diameter, but the conveyor was protected by these posts to the extent that it was started and used to carry out the material.

One of these emergency posts consists of two sawed blocks each 10x12x18 in., the blocks being arranged in combinations to suit roof height. With the horizontal, or bottom, block laid flat the post height is 28 in.; when laid on edge it is 30 in. A similar emergency posting, consisting also of one row on 10-ft. centers, but fitted with cap blocks where necessary to bring the top closer to the roof, protects the room conveyor. Posting of the room entry, normally 50 to 60 in. high, consists of four rows of split props on one side of the track.

Cycles and shifts without delays embody a method whereby more than one operation is carried on at one time, and the stopping and starting of shifts at any point of the cycle that the whistle happens to catch the work. After a cut is shot down, the loaders concentrate for a time at the inbye corner of the room and soon clear space for the cutters to begin. Then as the face clean-up progresses toward the other end, cutting follows closely but is done by steps because the machine men stop to drill and load holes ahead of the cutting. The face conveyor, beginning at the tail end, is pushed forward close to the mining machine so that the machine men can shovel the cuttings directly onto the conveyor, thereby saving a second handling.

Moving of the face-conveyor pan section and tail piece is done by three or four men assuming a sitting position on the mine floor back of the conveyor, bracing themselves against props and pushing with their feet against the conveyor. After the mining machine has retreated, the head section of the conveyor together with attached pans is moved by a ratchet post puller. Although the conveyor pans are rigidly bolted together the general design is so light that the conveyor flexes sufficiently to be advanced in a wave.

To spot cars under the room-conveyor loading head the member of the crew doing the trimming nips a cable on a 275-volt wire, or contact bar, to move the trip. This is the trailing cable of the reel locomotive which is left coupled to the trip and with its controller open to first or second point and with the brake set lightly.

During the few minutes that the men must desert the face to allow shooting

Roof Action in Conveyor-Mined Rooms, 1934

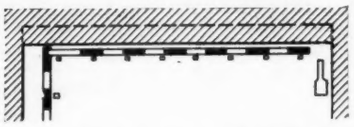
Jeffrey Conveyor Section

Room*	Completed	Roof Fell	Days Remained Open
1	Jan. 2	March 7	64
2	Feb. 1	March 12	39
3	March 10	June 28	110
4	April 7	April 7	0
5	May 5	May 23	18
6	June 1	June 28	27
7	June 20	.....	(Standing Dec. 15)
8	July 15	Aug. 5	21
9	Aug. 10	Aug. 19	9
10	Sept. 1	Sept. 8	7
11	Sept. 23	Oct. 1	8
12	Oct. 5	Oct. 13	8
13	Oct. 24	Oct. 28	4
14	Nov. 9	Nov. 10	1
15	Nov. 23	.....	(Standing Dec. 15)
16	Dec. 6	.....	(Standing Dec. 15)
17	(Working Dec. 15)	.....	.....

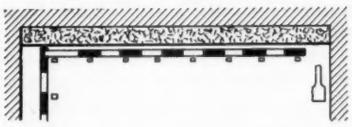
Ladel Conveyor Section

	Completed	Roof Fell	Days Remained Open
A	Oct. 20	Dec. 6	47
B	Nov. 10	.....	(Standing Dec. 15)
C	Dec. 5	Dec. 10	5
D	(Working Dec. 15)	.....	.....
E	(Next to be worked)	.....	.....

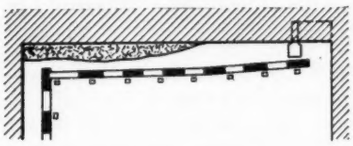
*See mine map of conveyor sections, p. 144.



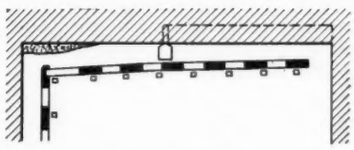
Conveyor Against Face, Coal Undercut, Holes Drilled and Loaded. While Face Is Shot Loaded Trip Is Hauled.



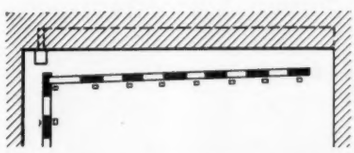
Coal Shot Down Along Entire Face. Normally But a Small Amount Is Thrown Out From the Face and Upon the Conveyor.



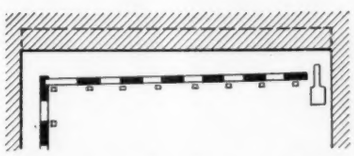
Face Cleaned at Right, Cutting Started, Tail End of Conveyor Pushed Forward and Safety Blocks Moved With It.



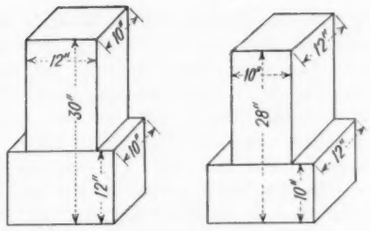
Loaders Finishing at Left, Conveyor and Safety Posts Have Been Moved as Cutting Across the Face Progresses.



Loading Completed and Cutting Following Closely. Crew Stopped Machine Several Times to Drill and Load Holes.



Machine Back at Rest Point. A 6-Ft. Section Will Now Be Added to Room Conveyor, and Other Conveyor Moved to Face.



Identical Blocks Arranged to Provide Safety Posts of Two Heights.

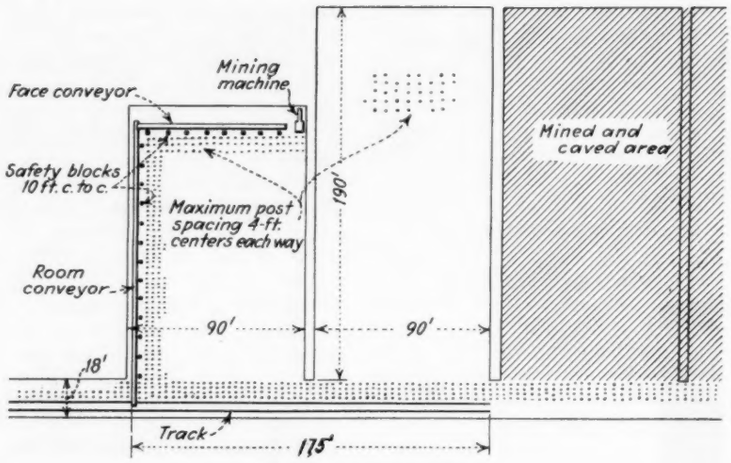
the coal the loaded trip is taken to the sidetrack and an empty trip brought back. So that there will be no car-changing delay while loading a cut, the empty trip includes one or two more cars than are needed to carry the production from one cut. In so far as possible the lunch period at the middle of the shift is adjusted to coincide with the shooting of a cut.

In the year and a half of conveyor work but one lost-time accident has occurred: A machine man sustained an injured kneecap when straddling the conveyor to hold the mining-machine trailing cable. Loading was going on at the time and a lump of coal caught his knee as it was passing under him on the conveyor. Apparently there was no necessity for the man exposing himself in such manner.

Dismantling and moving the two conveyors out of a completed room requires about 3½ hours for the crew of eight. The tail sections of both conveyors are dragged out by the mining machine. Pan sections, as disconnected successively beginning at the tail end, are laid two or three deep in the remaining part of the conveyor and thus carried toward the head section as the free end of the chain is pulled by successive starts of the motor.

A new room is started by hand loading into the cars three 6-ft. slabbing cuts 90 ft. in length along the rib of the entry. Setting up both conveyors, the next operation, requires about 7 hours. The developed territories in which the conveyors are working have room necks, which prove a slight disadvantage except in a few cases where the loading-head location happens to coincide with a neck, and thus the taking of top for the loading head is avoided.

Panels developed for the old method of mining and which will be worked with conveyors consist of solid blocks approximately 200x1,400 ft. Tracks have been taken up for the most part, so with the present method it is necessary to install room entry tracks and these are laid with 25-lb. rails on steel ties. It is planned to use mother belt conveyors 1,300 to 1,400 ft. long on the room heading to carry the coal from two chain-flight conveyor units, one on each side.



Conveyor Unit Working Layout.

Conveyors are now being served by fifty new mine cars purchased exclusively for that duty. Whereas the old cars (wood construction) are 36 in. high and have a water-level capacity of 74 cu.ft., the new cars (all-steel construction) are but 26 in. high and have a water-level capacity of 105 cu.ft. These cars, made by the Watt Car & Wheel Co. and equipped with stub axles with Timken bearings, average 4 tons as loaded at the conveyors.

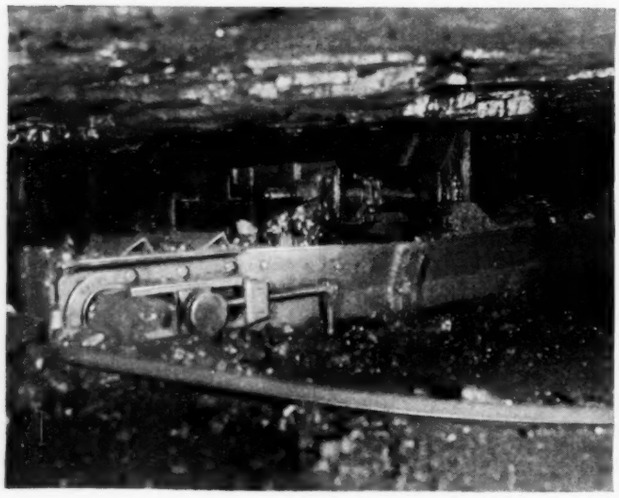
Cars excluded, the equipment investment per room is estimated at $11,600, assuming new machinery purchased at present prices. This includes mining machine, cable-reel locomotive, room conveyor, face conveyor, blower, tubing and electric drill.

Early in the conveyor work it was observed that low voltage was hampering production; therefore a 150-kw. motor generator was moved from an outside substation to a location inside of the mine about 4,000 ft. from the haulage portal. Power at 2,300 volts is carried to this substation by a No. 2 three-conductor rubber-insulated nonmetallic armored cable buried in a trench along the roadway.

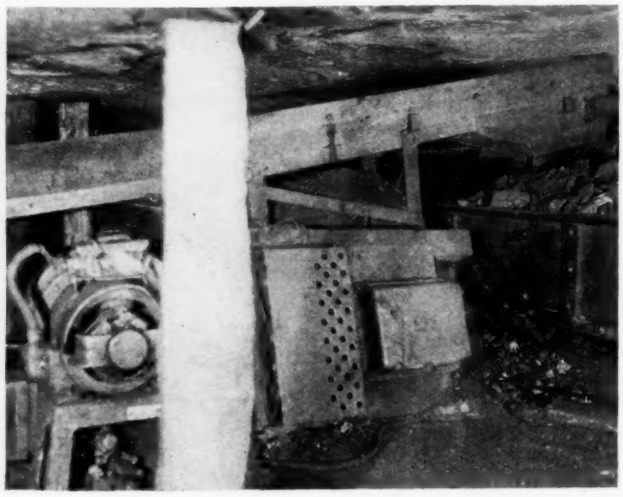
Triple shifting of the conveyor work has not been attempted but no particular difficulty is foreseen in adding the third shift when the extra production is required. Behavior of the roof is so favorable that work in a room could be stopped for a few days or a week if necessary, unless it were near the finish, in which case the conveyor would have to be removed and perhaps the remaining coal abandoned.

Although the total tonnage thus far mined by conveyors at Aflex is not large, the experience has been sufficient to demonstrate conclusively that the 32- to 34-in. seam can be mined profitably by conveyors.

Face Conveyor Discharging Into Room Conveyor.



Blower Beside Room-Conveyor Loading Head.



FILLS 110 FT. WIDE

+ Made Possible by Disposal Equipment

At Gravity Slope Colliery

BUILDING a wide refuse fill without shifting the equipment sidewise is effectively and economically accomplished by a combination semi-portable car dumper and stacker put into use about a year ago at Gravity Slope colliery of The Hudson Coal Co., in the northern anthracite field of Pennsylvania. The inclined fill stacked by the machine as it progresses in a straight line is approximately 110 ft. wide at the top.

As illustrated by the drawing showing the arrangement on the refuse fill, the dumper and stacker is designed for use at the end of a car track on a plane which is extended as the machine is moved forward on the incline. The equipment, built as a unit, consists of a cantilever approach, elevated dumping ramp for releasing the dump-car gates, main frame, headsheave for the car-incline hoist rope, dump hopper, belt feeder and belt distributing conveyor. The outer end of the latter is supported by guy rods carried back to an elevated section of the main structure. The machine rests upon and is moved forward over a track made up of three 4x10-in. wooden rails each consisting of worn guides removed from hoisting shafts. These wood rails are not recovered and are buried as the machine is moved forward over them.

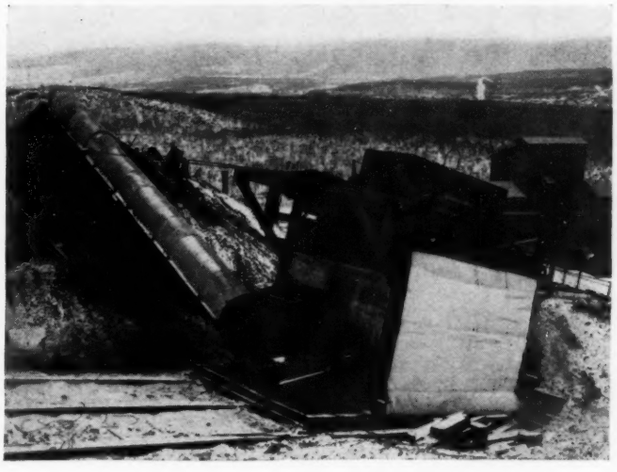
Movement of the machine is accomplished by manual operation of three 25-ton ball-bearing screw jacks which lie in steel channels that also support wood blocks which serve as fillers. In pushing the machine up the incline the jacks react against wood cribbing which holds the end of the track fill. Compression grease cups installed on the steel channels, which are the bottom sills of the machine, force lubricant between the sills and wood rails. After the usual move of 6 ft. is accomplished and the track reconnected, it is necessary to extend the refuse fill under the cantilever approach of the machine. To open the gates and thereby dump the refuse car when it is on the approach structure, dumping ramp fittings are temporarily bolted to the tops of the elevated rails. These ramps engage rollers at the ends of levers mounted on the car sides, thereby raising the levers and opening the gates. Ramps mounted permanently above the dump hopper effect the dumping during regular operation.

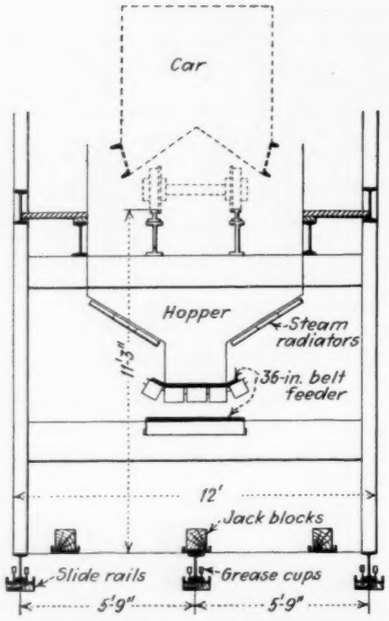
View of Dump From Cantilever Approach Track.

Adjusting the distributing boom conveyor to various points through the 180-deg. circle is effected by manipulating block-and-tackle guys on either side of

Looking Up the Bank at the Machine With Distribution Conveyor in Operating Position.

Car Dumping Into the Hopper. Screw Jacks Advance the Machine Over Three Wooden Rails.





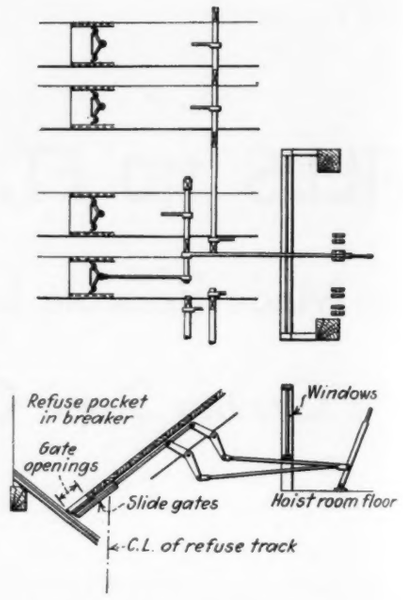
Section Through Center of Main Frame.

the conveyor which are attached to removable anchors installed in the refuse bank. Extra guys of manilla rope are employed as an added precaution to prevent high winds from swinging the boom. Except when making the 6-ft. moves, but one man is employed around the machine and on the fill. His duties consist of adjusting the boom position, lubricating the equipment, preparing the advance track and observing the operation of the equipment. A signal system is available for communication between the operator on the refuse bank and the hoist operator.

This refuse-handling machine, locally termed a "transfer hopper and distributing conveyor," was designed by the engineering department of the coal company and was built by the Robins Conveying Belt Co. The weight, approximating 56,000 lb., not including car and refuse loads, is carried on a base 12 ft. wide by 17 ft. long. Moving parts of the machine consist of the 5-ft. headsheave, the belt feeder and the distributing conveyor.

The feeder, which is a belt conveyor 36 in. wide and 18 ft. 8 in. long (pulley centers), is driven at 100 ft. per minute by a 5-hp. 440-volt gearmotor with a chain drive connection between its low-speed shaft (53 r.p.m.) and the conveyor head pulley shaft. The pivoted distributing conveyor, which is a belt conveyor 24 in. wide and 50 ft. long (pulley centers), is driven at 300 ft. per minute by a 7½-hp. gearmotor. A chain drive is used on this conveyor also. The gearmotor sprocket shaft, however, operates at 200 r.p.m. Both conveyors are equipped with rubber-covered troughing and return idlers and with 12-in. protected-screw take-ups. The distributing conveyor belt is protected by a semicircular top cover of corrugated copper-bearing galvanized steel.

The material handled is wet refuse, maximum size 4 in., from Chance cone cleaning equipment. To prevent freezing of this material the hopper of the machine is heated by steam radiators fastened against the sloping bottom and sides. During cold weather, canvas curtains are rolled down over the sides to exclude wind from the heated part of the machine. Extensions of the 440-volt electric line are infrequent because a rubber-covered trailing cable is used between the last pole and the machine. A small transformer mounted in the machine supplies 110 volts for lighting purposes.



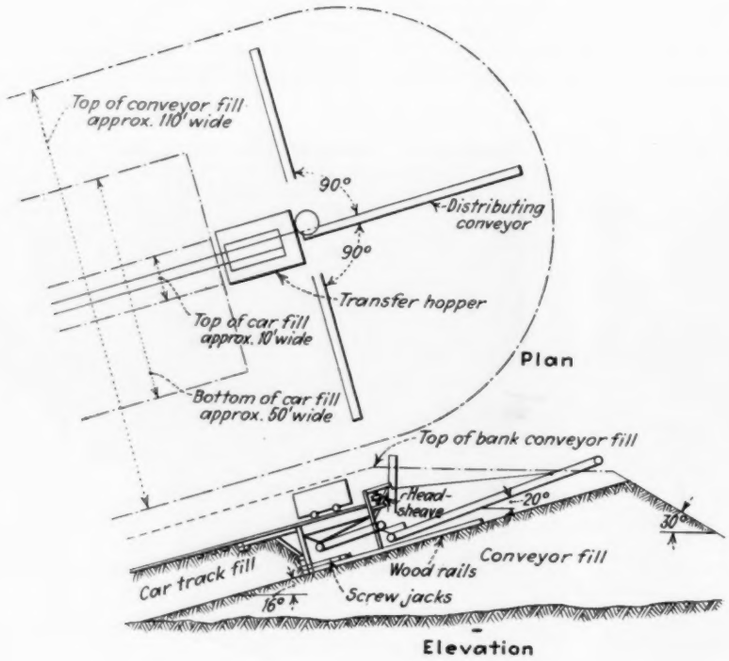
Centralized Control of Pocket Gates.

An important feature of the disposal system is a special gable-bottom dump car, also designed by the engineers of the coal company in conjunction with the American Car & Foundry Co. Dumping is automatic without tipping or tilting the car. Side gates, each consisting of 13-in. channels 13 ft. long, close and are held shut by gravity and therefore are without latches. Principal dimensions and specifications of the car are: water-level capacity, 290 cu.ft.; weight of empty car, 10,000 lb.; length, 13 ft.; width, 4 ft. 10 in.; height above rail, 6 ft. 6 in.; wheelbase, 5 ft. 6 in.; track gage, 30 in. Assuming the weight of the the wet breaker refuse as 70 lb. per cubic foot, a level-full carload weighs 20,300 lb. Normal rope pull to haul the loaded car up the 16-deg. incline is 16,000 lb.

Two sets of electric track-type limit switches are mounted on the track above the hopper. If the car is pulled beyond the normal stopping point the first switch is engaged and operates a warning signal at the hoist-control station in the breaker. If the car is pulled 18 in. farther, which is close to the danger point, the second limit switch is engaged, which, through solenoid action, closes the hoist throttle and trips a deadweight brake. Car travel from the refuse pockets in the breaker to the dumping and stacking machine is now approximately 850 ft. The crest of the hill has been reached, thus affording deeper dumping space and greatly in-

(Turn to page 156)

Arrangement of Equipment on Refuse Bank.



IMPROVING POWER FACTOR

+ Reduces Power Cost

And Promotes Efficiency

By A. S. BIESECKER
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THE COST of power generally is governed by the demand, or peak, the kilowatt-hour consumption and the power factor. The demand and kilowatt-hours for a given operation, or production, usually are beyond control, but the power factor can be controlled or corrected to any point desired. The consumer, or purchaser, of power should be interested in his power-factor conditions for two reasons. First, he usually is penalized, or his power bills are increased, in case his power factor is below a given value. Second, his operating conditions suffer because of low power factor.

Power factor is determined by the equipment on the property where the power is used, and low power factors due to lagging current are caused by the following:

1. High exciting current of transformers.
2. High voltage on induction motors, synchronous motors and rotary converters.
3. Low exciting current in the fields of synchronous motors and rotary converters.
4. Incorrectly designed transmission lines and distribution circuits.

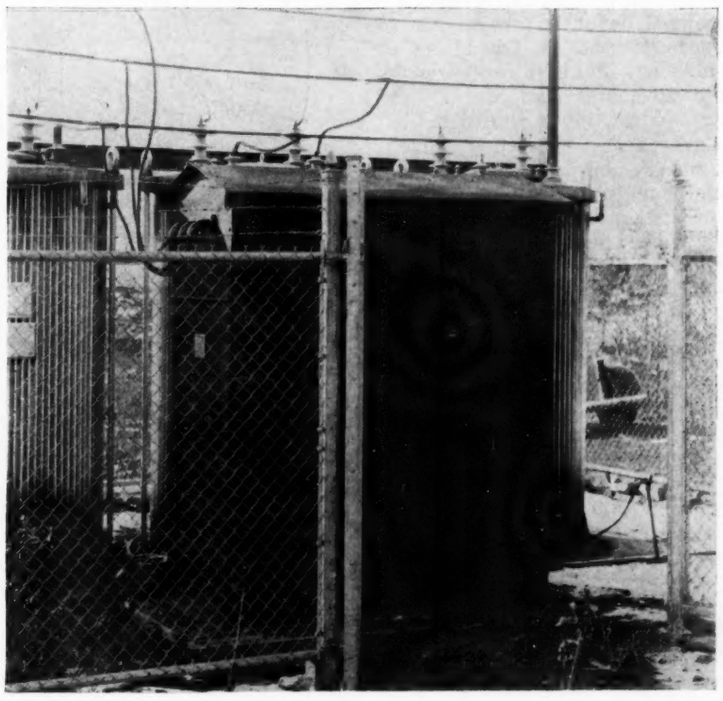
These statements may sound rather elementary to the electrical engineer, but nevertheless some or all of these conditions exist on most properties.

On modern transformers, the exciting current at normal voltage and frequency varies between 3 and 8 per cent, depending upon the size and voltage of the transformer. On transformers of older design, the exciting current and core losses may be so high that it would pay the owner to replace them with modern transformers. Conditions also are found where the primary voltage is so much higher than that for which the transformer was designed that the exciting current has been increased excessively. One of the worst conditions growing out of high exciting current results where the total kilovolt-amperes in transformers on the line is relatively high compared to the maximum demand, or peak load. Too high a voltage on induction motors reduces the power factor, and their operation at fractional loads also gives a lower power factor than would be obtained if a motor of smaller horsepower rating were used. Synchronous motors and rotary converters operated on too high a voltage often make it impossible to obtain the proper power factor, due to the field being too weak. On rotary converters it is sometimes found that the direct-current voltage is lowered by weakening the field. As this results in a lagging current and low power factor, the a.c. voltage should be lowered and the field adjusted to give approximately 100 per cent power factor.

The design of the transmission line often is overlooked from the standpoint of power factor. This condition is found more often, and is more pronounced, in low-voltage a.c. circuits, where the reactance is high because of high current, wide spacing of conductors and long circuits.

All of the above conditions lead to low power factor, and low power factor increases the loading. This combination of

One of Two 240-Kva. Capacitors at Colonial Colliery.



low power factor and increased loading in kilovolt-amperes results in greater voltage drops or wider regulation in transformers and transmission circuits. This voltage drop increases rapidly as the lagging power factor is decreased.

Low voltage is the cause of a large percentage of the trouble with electrical equipment. In lighting, it results in poor and inefficient illumination; with motors, the starting and maximum running torques are reduced; with control equipment, low voltage results in improper functioning. In general, it is the cause of many of the failures from burned-out apparatus. If a proper analysis could be made, it would be found that on many properties, low power factor and low voltage cause the operating company more expense than the penalty paid to the power company for low power factor.

From the above, it will be seen that equipment should be operated on approximately the voltage for which it is designed and that deviation from this voltage, either above or below normal, results in poor operating conditions and additional expense.

Prior to the depression, power-factor studies were not made as generally as they should have been, but during the recent lean years, all costs of production have been more closely scrutinized. As a result, the writer has made an analysis of power-factor conditions on several coal properties. A number of systems of making the analysis were tried. Naturally, a system which would give the desired information from the electrical engineer's standpoint and at the same time give the management of the property a picture of conditions was preferred. The following method was finally adopted.

In making the preliminary survey, a set of curves was plotted from data given on the power bills for the previous twelve or eighteen months. A typical set of curves is shown. The base line represents the kilowatt-hours used during the months. Against this is plotted the bill in dollars, kvarh. (reactive kilvolt-ampere hours) and power factor. As a matter of interest to the customer, the rate in cents per kilowatt-hour and the days worked per month were shown. All of the above are in full lines. The curve was found to be a straight line. The calculated core losses are represented by *OV*. If the kvarh. line is extended to *OE* until it intersects *VG*, the line *OE* will represent the kvarh. per month due to transformer exciting current, which in this case is 490,000. If this is divided by 720, or the hours in a month, it will be found that it will take a capacitor of approximately 700 kva. rating to neutralize the transformer exciting current. The new conditions, due to the installation of the capacitor, are shown in dotted lines. The resultant new kvarh. is represented by line *OJ*, and changes in other apparatus reduced the kvarh. to line *OM*. The corresponding new power factor is shown by *RS*.

Such a capacitor installation would cost approximately $7,000 and result in reducing the power bills $500 per month, or $6,000 per year. This indicates an annual return on the investment of 85 per cent.

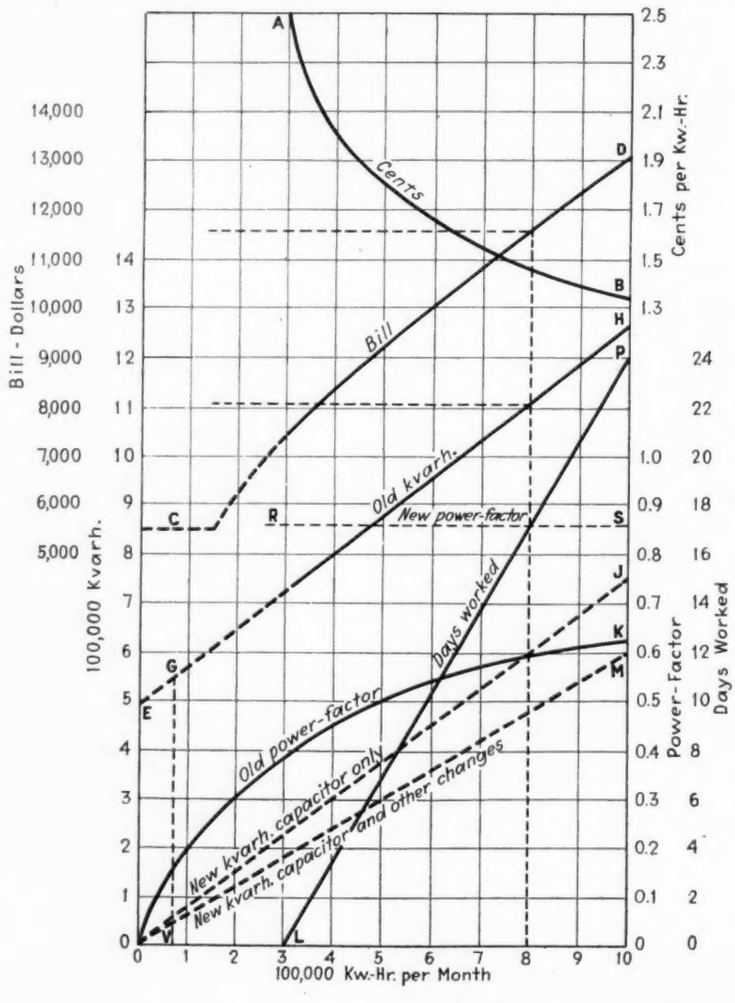
It will be noted that at the average monthly consumption of 800,000 kw.-hr., the power factor was raised from 59 to 86 per cent. A number of reports have been made on coal properties with the result that capacitors have been installed. The one illustrated is one of two 240-kva. General Electric capacitors installed by the Colonial Colliery Co. at Natalie, Pa. Savings check very closely with those predicted in the original reports, which showed that capacitors would save their cost in from twelve to eighteen months, or earn an annual return on the investment from 100 to 65 per cent.

On many coal properties, the neutralizing of the wattless current due to the exciting current of the transformers by use of capacitors will raise the power factor to 80 per cent or above. It will be noted from the curve sheet that when this is done the new power factor is practically a straight horizontal line and that the power factor is constant regardless of the days worked or the kilowatt-hours used per month. If, after the above analysis has been made, it is found that the neutralizing of the transformer exciting current does not give a satisfactory power factor, further tests and corrections can be carried out.

For correcting the power factor due to the exciting current of transformers which are on the line practically all of the time, the capacitor is the most economical piece of apparatus. This results from the fact that it has no moving parts, requires little attention, losses are only one-third of 1 per cent, and leading wattless current neutralizes or balances the lagging wattless current arising out of transformer excitation.

The above discussion has dealt with conditions where power is purchased and the reactive component is metered, but in cases where the consumer generates his own power, a power-factor investigation will generally disclose where and how large savings can be made.

Graphic Power-Factor Study, Showing Effect of Changes on Power Cost.



AERIAL TRAMWAY

+ Part of Modernization Plan

For Centralizing Preparation at Highcoal

TWO YEARS AGO officials of the Anchor Coal Co., which operates at Highcoal, Boone County, West Virginia, were faced with the necessity of "doing something" with two tipples which had become obsolete. As the plants were less than half a mile apart, it was proposed to concentrate by abandoning one tipple and erecting an aerial tram to deliver to the other one and also to modernize this tipple, to increase capacity and improve preparation. This plan was adopted, and, for an expenditure far less than what it would have cost to improve both tipples, the company now enjoys the advantage of the reduced labor cost by operating but one preparation plant instead of two. The tram is the continuous automatic type, and the drive, which is by direct current, involves several electrical refinements that provide automatic governing and dynamic braking of the overhauling load.

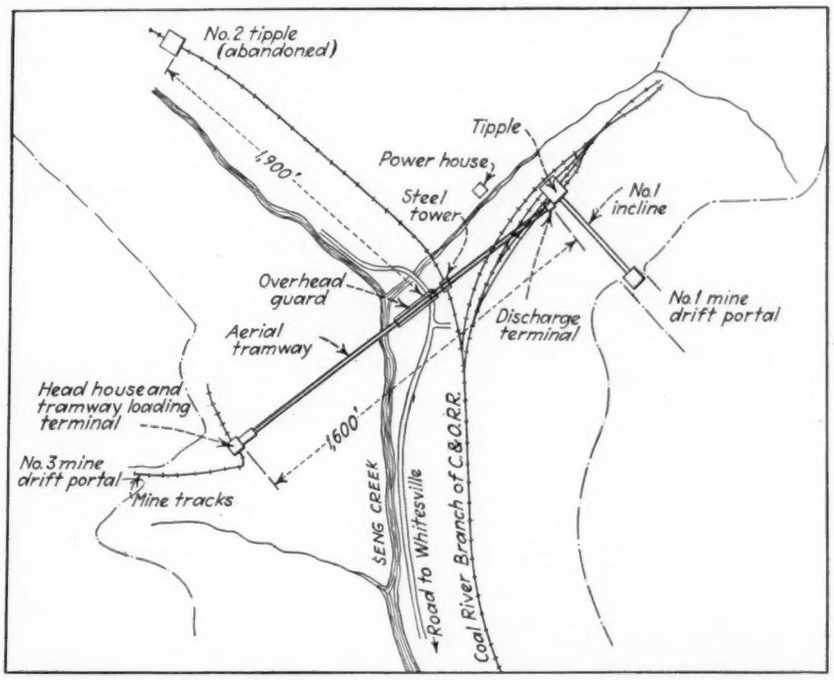
An Interstate automatic aerial tram to deliver coal across a valley to the No. 2 tipple, now abandoned, had been installed a few years ago. Soon after it was put into service, however, the mine was shut down and was not opened again until after the improvements of last year. The principal parts of this tram, practically unused, were utilized in the construction of the new tram, which is considerably longer than the initial installation. The working area served by the new aerial tram is known as Mine No. 3. It is in the Dorothy seam, here averaging about 8 ft. in thickness, lying nearly level and outcropping at an elevation 240 ft. above the railroad tracks. Mine No. 1 is in the same seam and its coal is lowered in mine cars on an incline to the No. 1 tipple, which is now the central plant.

The aerial tram is 1,600 ft. long and crosses above the Chesapeake & Ohio Ry. and above a street of the town. Protection for the railroad and street against the possibility of falling coal is provided by an overhead screen guard 250 ft. long. Ropes suspending this guard are fastened at one end to a steel tower erected on the railroad right of way and at the other end to an anchor on the hillside. This tower on the right of way also acts as a support for the track cables of the tram.

Twenty-six 20-cu.ft. capacity four-wheeled cars are spaced 125 ft. apart. The two track cables supporting the loaded cars are 1⅛-in. diameter, locked-coil construction. Two cables of the same type, but ¾ in. in diameter, carry the empties. The endless traction rope to which the cars are permanently attached is ⅝-in., 6x19 construction, plow-steel grade. At the present car speed of 400 ft. per minute the tram capacity is 125 tons per hour. By purchase of more cars and a rearrangement for closer spacing, the capacity can be increased about 25 per cent. The limiting feature to closer spacing of cars is the time required for closing of the weigh basket door and filling of the weigh basket. A higher rope speed would be disadvantageous from the standpoint of bringing about undue spillage in loading the moving cars.

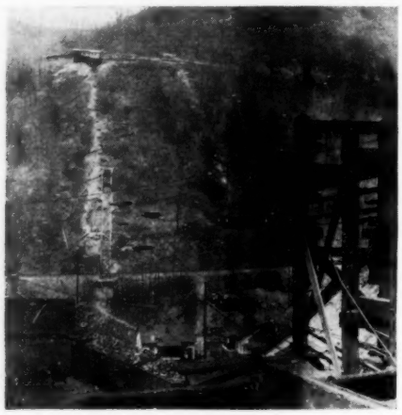
Electric drive and braking equipment of the aerial tram are located at the combination mine-car dumphouse and tram-loading terminal. Mine cars are tipped in a Roberts & Schaefer rotary dump operated by electric motor. From the 60-ton storage hopper the coal is moved by a reciprocating feeder to a special weigh basket which insures uniform loadings of the tram cars. Inasmuch as these cars do not stop or slacken speed for loading, the auto-

Fig. 1—Plan Showing the Old Tipple and the New Arrangement at Highcoal.



matic operations of the feeder and weigh basket must be adjusted to an accurate timing and kept in that relation.

After the tram has been started, the feeder will begin operation as soon as the weigh basket empties and its door swings closed. After receiving a certain weight of coal, the basket overbalances a counterweighted lever or pivoted cradle and swings down a few inches. This movement actuates an electric switch which stops the feeder. The motor of this feeder is equipped with solenoid brake to arrest the motion quickly, and a curtain of heavy chains prevents "dribble" of coal. When a tram car comes under the weigh basket it trips open the door which latches in open position and remains so a few seconds until it is released by the same car after this car has received its load



Aerial Tram as it Appears From the Discharge Terminal.

and is leaving the location. Gravity swings the weigh-basket door closed. This completes the cycle and closes a switch to restart the feeder if the empty weigh basket has already moved back upward and closed another control switch that is connected in the same circuit.

The aerial tram is driven by a 15-hp. shunt-wound d.c. motor equipped with solenoid brake. Because the load overhauls the motor and generates a small amount of power, it was necessary to provide for automatic speed governing and for dissipation of the energy. A shunt-wound motor was used because the compound-wound type has an entirely wrong characteristic for such duty. Even a shunt motor, if not controlled, will allow a speed increase of approximately 50 per cent when generating less than half its rated horsepower.

Control equipment of this installation at Highcoal consists of a field rheostat and a General Electric Type TD Form W1 speed regulator. The motor, which is wound for normal speed with a certain amount of resistance in the field circuit, has a Type TD Form WB control device on the end of the shaft. This centrifugal switch connects the speed regulator into circuit when the tram driving motor is overhauled by the load and attains an overspeed of a few per cent. The regulator then increases the field strength of the motor, which has then become a generator, truly speaking, thus causing it to generate more power and to slow the driving load.

The solenoid brake of the tram drive motor is not permanently connected across the motor terminals because with that normal type of connection the brake would not operate to stop an overhauling load. Instead the connection is such that the brake is automatically disconnected from both power line and motor terminals when the motor stop switch is operated, when power fails, or when the motor overspeed switch operates. This overspeed switch is on the opposite end of the motor shaft from the speed-control device previously mentioned.

Tram cars are discharged at the No. 1, or central, tipple as they pass around the tail sheave and turn upside down to return in that position on the empty-track cables. A counterweighted and hinged curved steel plate, made to the same width as a tram car, prevents the coal from flowing out until the car is practically upside down and close to the bottom of the chute. From this point an apron conveyor delivers the coal to the main screens or to a crusher. No operator is required to run the tram. The starting and stopping is a pushbutton operation handled by the mine-car dumper at the headhouse and loading terminal.

Changes to the original three-track tipple raised its capacity to 400 tons per hour and added one loading track. New equipment installed includes McNally-Pittsburg main shakers, two roll-type crushers, conveyors, and a loading boom. The plant is now equipped with three loading booms. The screen arrangement is such that without changing screen plates there can be produced

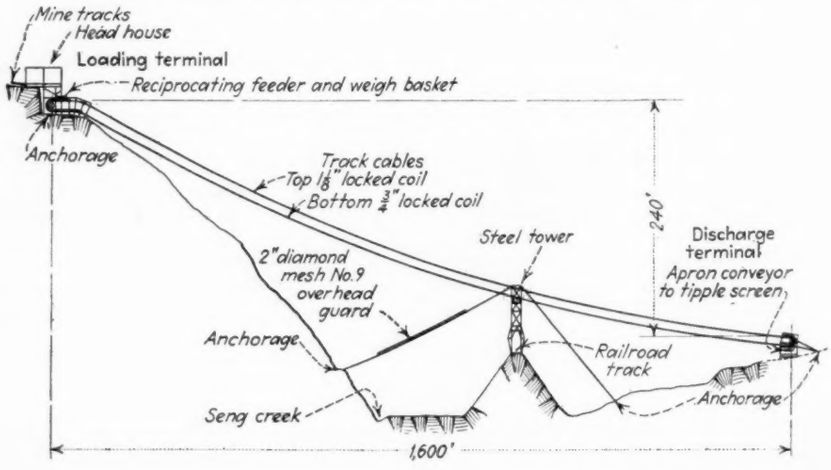
View of Tram and Headhouse From Tipple Track. At the Left, G. H. Hornickel, General Superintendent; to His Right, Van B. Stith, Superintendent of Mines.

choices of four sizes of slack, four sizes of egg, three sizes of nut, and four sizes of lump.

The larger of the two crushers has a capacity of 250 tons per hour and is installed ahead of the main screens. By a flygate arrangement the run-of-mine coal from the dump hopper can be sent to this crusher or to the main screens. The other crusher has a capacity of 75 tons per hour and is used to reduce to slack size the soft "gas coal" which is hand-picked from the splinty coal of which the Dorothy seam principally consists.

Present production of the two Anchor mines totals approximately 1,500 tons per day, but it is estimated that the mines and plant are now equipped to produce 2,400 tons per day if the demand should come.

Fig. 2—Profile of Tram From No. 3 Mine to Central Tipple.



VOLUME VS. PRESSURE

+ In Mine Ventilation

By W. J. MONTGOMERY
Manager, Ventilation Division
Jeffrey Manufacturing Co.
Columbus, Ohio

OBVIOUSLY, before a fan can be selected to fit the ventilation requirements of a mine, the requirements must first be ascertained. This determination should cover not only current requirements but future needs as well. Among the factors that must be taken into account, most important are volume and resistance. Tied in with these are several dependent factors, such as airway capacity and allowable velocity. The objective guiding all considerations should be adjustment of the above factors for avoidance of unnecessary losses. That objective, in other words, has to do with disposition or distribution of the volume. It can be attained only by adherence to the full meaning of relative mine-ventilation efficiency, which efficiency was discussed at length in a previous article (*Coal Age*, Vol. 40, p. 107). In the following, the various factors are taken up one at a time, with due attention to means of avoiding losses which interfere with ventilation efficiency below ground.

What volume is required to ventilate a mine? The mining laws in many States specify 100 cu.ft. in non-gaseous and 200 cu.ft. in gaseous mines for each man. This, obviously, is an arbitrary figure, for the laws further state that the inspector may demand whatever additional volume he believes necessary to make the mine safe and healthful.

Despite these provisions, there is no definite understanding as to what constitutes a sufficient quantity of air. Neither the owner nor the inspector is sure of his footing. In some cases too little air is provided, but, giving them due credit, the error in other cases is on the side of surplus. While adding to safety in some respects, excess air is accompanied by higher velocity, and thus is introduced an unreckoned hazard. To furnish this volume a fan of a size in excess of actual requirements is installed. Therein is taken the first step away from ventilation economy. This is not intended as an argument for diminution of ventilation requirements. It is held as a plea for logical arrival at those requirements.

A man at work breathes only about 1 cu.ft. of air per minute. The remaining air is needed to sweep out the gases emitted by the strata and dilute the vitiated air. Why, then, are the air requirements fixed by law as so much per man and so much additional per animal? If some semblance of accuracy is desired, volume requirements ought to be established on some other basis. Certainly it would be better to specify a certain volume for a given area of exposed surface—say 100 cu.ft. per minute for each 100 sq.yd. of surface for non-gaseous mines, and 2½ to 3 times that unit for gaseous mines. A basis of this sort would serve to determine future requirements. Current requirements should be fixed by air analysis for gas content and for oxygen deficiency. The problem is here offered as a study well worth the attention of the U. S. Bureau of Mines, since guessing should be made neither part nor parcel of any safety code, much less one dealing with coal mining.

Table I—Allowable Velocities For Various Travel Distances

Distance of Travel (feet)	Allowable Velocity (feet per minute)
100 to 500	2,000
500– 1,000	1,400
1,000– 2,000	1,000
2,000– 4,000	700
4,000– 8,000	500
8,000–12,000	400
12,000–16,000	350
16,000–22,000	300

Table II—Influence of Size of Airway On Mine Ventilation Power Cost

Size of Airway	Perimeter Feet	Area Sq.Ft.	Relative Power	Relative Cost Per Year 1½c Per Kw.-Hr.
14 ft.x6 ft. 6 in.	41	91	17.2	$1,686.00
13 ft.x6 ft. 0 in.	38	78	25.3	2,480.00
12 ft.x5 ft. 6 in.	35	66	38.4	3,763.00
11 ft.x5 ft. 0 in.	32	55	60.7	5,950.00
10 ft.x4 ft. 6 in.	29	45	100.5	9,850.00
9 ft.x4 ft. 0 in.	26	36	175.7	17,220.00
8 ft.x3 ft. 6 in.	23	28	330.8	32,425.00

The direct causes of mine resistance are: (1) rubbing of air against the top, bottom and sides of air passages; (2) changing of flow direction at turns in the airways and by obstructions, such as timbers and offsets; (3) sudden contracting and expanding of air flow. Supplementary to these are the effects of air leakage, which for convenience are considered alone later in this article under the heading of "fugitive air." The use of regulators does not belong here because they comprise deliberately introduced resistance.

By far the biggest contributor to resistance, of course, is rubbing friction. Were it not that resistance varies as the square of the velocity, this opposing factor would not be so serious. The actual effect may be explained as follows: If the air travels at 1 ft. per minute, then 1 sq.ft. of air (thin section) will pass over 1 sq.ft. of rubbing surface in 1 minute. Traveling at the rate of 2 ft. per minute, 2 sq.ft. of air will pass over 1 sq.ft. of rubbing surface in 1 minute, which doubles the resistance. In that case each square foot of air will pass over each square foot of rubbing surface in one-half the time, or twice as fast, which again doubles the resistance. This explains why four times an initial pressure is required to double the flow of an initial volume. It explains also the necessity for keeping headings straight and smooth of surface.

The coefficient of friction is a greatly variable factor in mine ventilation. Its value depends to a small extent on the

density of the air, but by far its greatest variation is influenced by the character of the rubbing surface. As coefficients suggested by various authors differ in the ratio of at least 1 to 6, it is evident that the derivation of each was made under a different condition. The value given this function for a smooth pipe certainly would not be applicable to the jagged surface of a mine airway. Air will flow quietly over the smooth surface of a pipe; but in passing through a mine opening, the air particles tumble over each other, setting up millions of small eddy currents adjacent to the confining surfaces.

There is but one practical solution to the problem and that is to assign a different value to the coefficient for each usage, depending upon the rubbing surface. The value given by Atkinson (0.000,000,0217) is generally considered as being entirely too high for the average mine. It is held that a value of 0.000,000,01 is more in line. In view of the above opinion. the following values are suggested:

0.000,000,004 for straight and smooth airways such as concrete shafts or timbered shafts with a smooth surface.

0.000,000,007 for untimbered airways of uniform cross-section, smooth and straight.

0.000,000,01 for crooked airways, not uniform in cross-section, moderately rough of surface, with few timbers.

0.000,000,015 for crooked airways, not uniform in cross-section, rough of surface, heavily timbered, cluttered by many falls.

0.000,000,02 for airways driven through rock, having a jagged surface and sharp projections. A timbered shaft without facing and having a stairway falls into this class.

Rather than attempt to determine what the resistance will be, it is better to decide that the mine shall be so developed and maintained that its water gage will never exceed 3 in. on everyday duty. If possible, the gage should be held to an even lower figure. Should a substantial increase of volume be required at a mine previously restricted to 3-in. gage, methods other than raising the pressure ought to be employed to obtain the new volume requirement. The desired end can be reached by splitting the air, enlarging or cleaning up old airways and driving new ones.

The principal reason for shunning as far as possible the attainment of additional volume by higher pressure is the power cost. For example, a fan delivering 100,000 cu.ft. at a 3-in. gage will have a power consumption of only 63 hp. If, with the same mine conditions, the fan speed were increased to deliver 150,000 cu.ft., the power consumption would jump to 215 hp. But if changes were made that would enable the fan to deliver the 150,000 cu.ft. at 3-in. pressure, the consumption would be only 95 hp. Such inherent savings are sufficient reason for recommending that a mine not be allowed to get into a condition requiring a pressure greater than 3 in.

The velocity equivalent of 1-in. pressure is 4,000 ft. This relation is derived as follows: A fluid will flow through an outlet at the base of a vessel with a velocity corresponding to the pressure at that point. A body in falling will attain a velocity per second equal to twice the square root of a distance it falls multiplied by the acceleration due to gravity. It is from this statement the formula is obtained:

$V=\sqrt{2\ G\ H}$, where V=velocity in feet per second,

G=gravity or the distance the body will fall in the first second, 32.16 ft.

H=height from which the body falls in feet.

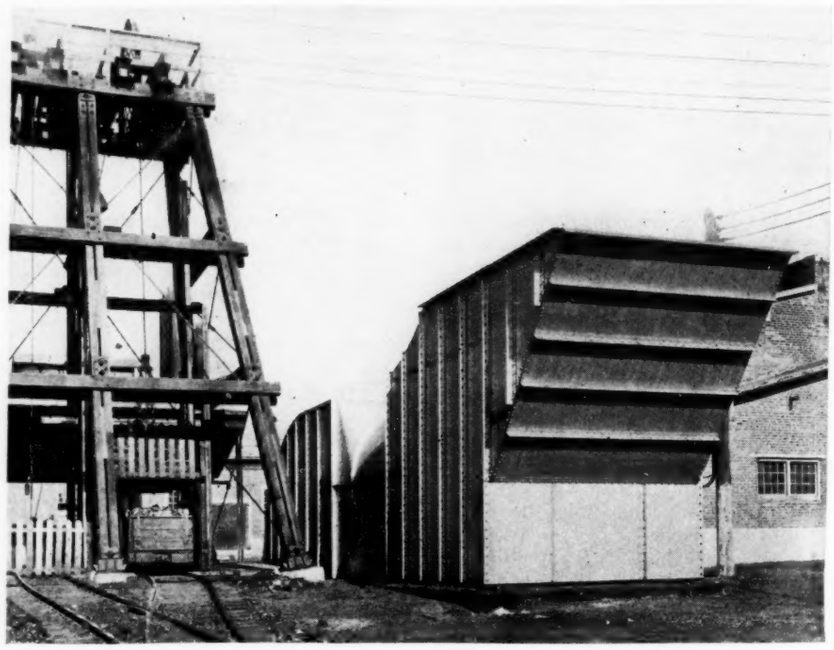
Pressure in air is expressed as so many inches of water gage per square foot. One-inch gage is equivalent to 5.2 lb. because 1 sq.ft. of water 1 in. deep weighs 5.2 lb. A cubic foot of air at normal mine temperature and average barometer—about 29.5 in. of mercury—will weigh approximately 0.075. Therefore dividing 5.2 by 0.075, it is found that the weight of an air column of 69.33 ft. is equal to 1-in. water gage. Substituting the formula

$V=\sqrt{2\ G\ H}$

$V=\sqrt{2\ (32.2\text{x}69.33)}=66.8$ ft. per second.

Inasmuch as all velocities in mine ventilation are stated as so many feet per minute, by multiplying 66.8 ft. per second by 60 seconds per minute, the velocity equivalent of pressure—roundly, 4,000 ft.—is obtained.

It may well be asked what this derivation has to do with mine resistance. The answer obviously is that there must be some force or head to cause the air to flow through the mine. This force, which generally is created by the fan, can be represented as an air column. Total pressure is comprised of two increments, one causing air to flow—velocity pressure—and the other overcoming mine resistance—static pressure—by far the larger component. The fan should be credited with this total pressure in computations of its efficiency because it accomplishes work in generating the velocity head.



Propeller Type Fan Installation With Steel Hood Extending Over Airshaft; Chimney Discharging Air Vertically.

Resistance offered to turning of air at the bottom of shafts, at overcasts and in the airways amounts to quite an item, especially when velocities are high. If air is turned through a right angle at the shaft bottom or at an overcast, the rubbing surface should be well rounded off. Where the velocities are unusually high, guide vanes would be beneficial. A velocity of 1,260 ft. per minute is equal to 0.1 in. pressure. Experience has proved that to turn air at this velocity through 90 deg., double the pressure is required, or 0.2 in. This is why abrupt turns should be avoided in the handling of velocities of 600 ft. and higher.

A decided airway constriction which begins and ends abruptly and extends over any great distance greatly increases the resistance. If, however, the contraction and expansion are made gradual, as in a venturi, there will be practically no loss except that due to

frictional resistance at the increased velocity. Therefore, when a fall occurs in an airway and time does not permit its removal, smooth out the fall and taper off both ends equally. Care must be exercised that no sharp projections from the fall or the roof obviate a smooth surface. This practice noticeably reduces friction losses and is prompted by Bernouilli's theorem that the sum of the static and velocity pressures is always equal after allowing for friction losses.

It is just as important to maintain ample airway capacity as it is to prevent short-circuiting of the air. Yet in the development of a mine little thought is given to what constitutes ample airway capacity. The enlargement of airways once developed usually is prohibitive, either from the standpoint of cost or feasibility. That is why it is safer to provide ample airway capacity from the beginning. Then the air moves at a low velocity and resistance is proportionately low, since resistance varies as the square of the velocity. In Table I is provided a guide to use for adherence to best practice. The values are for the average mine, with airways measuring 60 sq.ft.

No air current should be allowed to travel a distance in excess of 22,000 ft. For requirements beyond this limit, the travel should be shortened by the sinking of an airshaft or the driving of new openings to the outside.

Since the power varies as the cube of the r.p.m., doubling the r.p.m., or volume, without increasing the airway capacity increases the power consumption eightfold. This explains why it is so essential during the first few years of development to hold power consumption to an extremely low figure by providing large airways.

Nothing should more impress the operator with the importance of large airway capacity than a relative cost tabulation. The relative power required to pass equal volumes through airways of a given length, but of different area and perimeter, varies as the perimeter divided by the cube of the area. The influence of airway capacity on the cost of this power is indicated in Table II, which is computed for various sizes of airways, all of the same length, assuming that a 14x6½-ft. airway requires 17.2 hp.

The wide variation in relative costs of carrying the same volume through airways of different sizes should appeal to the economy interest of every mine-operating official. As the table plainly shows, an increase of merely 1 ft. in the width and of 6 in. in the height of an airway cuts the relative power cost 30 to 45 per cent. An increase of 2 ft. in width and 1 ft. in height reduces the relative cost 55 to 70 per cent. This table reflects a wider cost saving opportunity in the thinner seam mines. It should therefore be of particular significance to the owners of such mines. Especially is this true of conveyor mines, where new methods may be so devised as either to materially aid or greatly obstruct ventilation economy. In the light of this table the determination of the degree of roof brushing, bottom taking and disposition of rock takes on a fresh incentive.

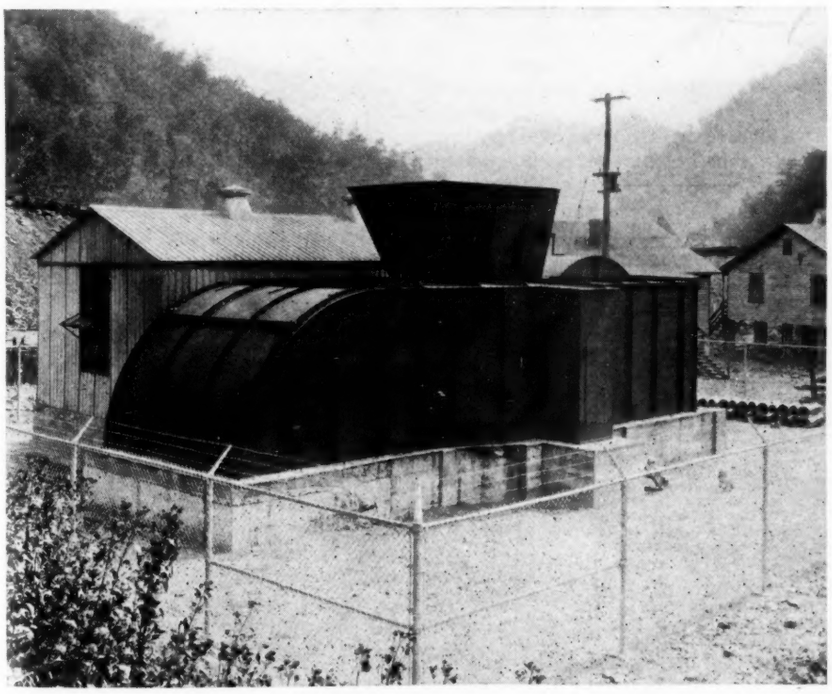
More important than the volume-pressure rating of a mine is the disposition of the volume. Compare the results in two mines having the same characteristics except that the first short-circuits less air through defective stoppings, doors, etc. Although each fan delivers the same volume against the same water gage, 75 per cent of the air delivered by the first fan reaches the working faces, whereas only 25 per cent of the air delivered by the second fan is effective at the faces. Increased production at the second mine may make it desirable to conduct as much air to the faces as reaches those in the first mine. To accomplish this without improving ventilating conditions would necessitate tripling the speed of the fan. Delivery of the air would be made against nine times the water gage and with 27 times the horsepower.

If pressure and horsepower varied directly as the volume, air leakage would not be so serious. But as pressure varies as the square of the volume and the horsepower as the cube with relation to fan speed, to double the volume requires four times the pressure and eight times the horsepower. Consequently, while small and obstructed airways add greatly to the power bill, the expense they entail is small compared to what the operator pays for "fugitive air." By fugitive air is meant that air which takes the shortest path between intake and return, stealing through stoppings, doors, overcasts and shaft partitions, instead of traveling to the intakes of final splits and then satisfying requirements to the last open crosscut.

Tests to show the quantity of air delivered by the fan and the percentage reaching the last crosscut furnish convincing evidence of this great waste. One such study made by the U. S. Bureau of Mines and embracing sixteen mines disclosed that individually and grouped, the plants were highly inefficient in ventilation at the time of the tests. Although the fans handled a combined volume of 1,257,000 cu.ft., only 243,000 cu.ft., or about 19 per cent, was effective at the faces. Assuming the average water gage as 3 in. and the over-all efficiency of fans, motors and drives as 60 per cent, power requirements would be 990 hp. If the fans handled only the effective volume, that actually reaching the workings, at 3 in. pressure, but 192 hp. would be needed. However, for this diminished volume, the pressure would be considerably lower. In a conservative assumption the pressure would not be more than one-fourth of the original, or ¾ in. Calculating on this basis, the horsepower required would be 48 instead of 990.

Alongside of this exhibit of gross inefficiency, what matters a loss of 4 or 5 per cent in the efficiency of the fan at a properly ventilated mine, compared to an air-leakage loss of 80 per cent in plants where stoppings are more like sieves than closures? Expressed

Double-Inlet Reversible Fan Fitted With an Air Lock.



in dollars and cents for power cost, these losses loom mountainous in proportions. With the fans in continuous service and the input at 990 hp., or 738.5 kw. equivalent, the power consumed at 1½c. per kilowatt-hour would cost $97,100 yearly. Confining the bill to only the energy that would be consumed were the ventilation completely effective, the power is 35.8 kw. and the cost $4,707. The difference, $92,393, is the cost of fugitive air. It is over 1,900 per cent higher than it would be under ideal conditions.

Of course, the ideal cannot be reached. The intention is not to imply that all of the air handled by the fan can be directed as desired. Owing to the difficulty of erecting and maintaining airtight overcasts and stoppings and of holding down leakage through doors, some air loss can reasonably be expected. But this tolerance should not be held as an excuse for abnormal losses.

Avoidance of many stoppings is a recommended practice in the development of all mines. By driving two or more intakes and an equal number of returns, the intervening barrier may be maintained more as a solid pillar than as a chain, for breakthroughs then can be separated by longer distances up to 600 ft. In addition to reducing fugitive air, the multiple system improves ventilation to the extent that it increases airway capacity and further lowers velocity and resistance.

Some of the waste can be avoided by periodic inspection and repair of stoppings and overcasts. In the case of stoppings, however, this work might be greatly hampered by the all-too-common practice of stacking refuse against these walls. It will be argued, and rightly, that this practice minimizes possibility of the stoppings being blown out by an explosion. Be that as it may, more important than preparing for an explosion is the taking of steps to avoid one.

Of other means to minimize air loss, one is to create air locks by erecting mine doors in pairs wherever feasible and to construct all doors in a more workmanlike manner. Yet another way, and unquestionably the most effective, would be to restrict the number of crosscuts. This precaution is especially effective in the first two or three thousand feet of the airway system away from the intake or return opening, where losses are at a maximum because velocity and pressure reach their peaks there. Air velocities along this sector are almost always too high. High air velocities absorb the pressure, part of which would otherwise be utilized to sweep the working places with a copious supply of fresh air; they simultaneously cause high resistance, which in turn raises the power requirement. Besides, high pressure on the stoppings causes excessive leakage; a greater volume of air must be handled by the fan, consequently, and again the power requirement is increased.

Fills 110 Ft. Wide Made Possible By Disposal Equipment

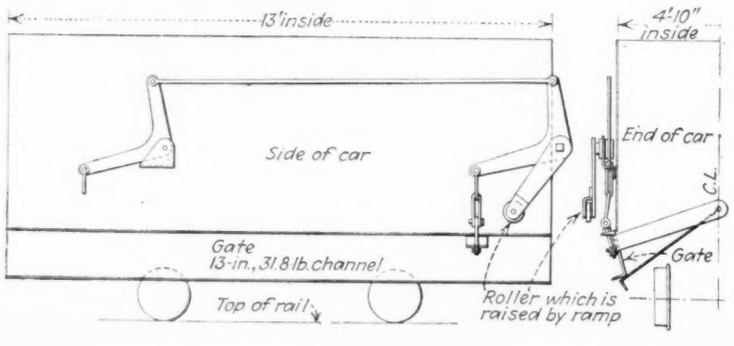
(Concluded from page 148)

creasing the tonnage that can be deposited per move.

Rope speed is now 500 ft. per minute, but the hoisting engine has ample capacity to increase the speed to 1,000 ft. per minute when the haul becomes long or if increased tonnage must be handled. The steam hoist is a two-cylinder, 14 x24-in. machine with a single drum 6 ft. in diameter and 5 ft. wide.

To allow the hoisting engineer to load the car, thus holding the normal refuse disposal crew to two men, controls of the eight rock-pocket gates were centralized to four levers in the hoist room, which is adjacent to the loading track.

Gate-Lifting Mechanism of Dump Car.



Windows afford the operator a full view. Capacity of the breaker refuse bin is 100 tons and this is approximately the quantity resulting per hour of breaker operation. Seven hundred tons of refuse is now hauled and dumped per shift. With the disposal system formerly employed, 14 to 16 hours was required to handle the same tonnage. The old method was based on hoisting three side-dump cars (75 cu.ft. each) to the top of a long incline, where they were uncoupled and three waiting empties substituted to be lowered to the breaker pockets. Loaded cars at the top were moved and dumped manually and the normal crew, including the hoisting engineer, consisted of seven men. At times extra men were employed to lay tracks. The new disposal system utilizes dumping space closer to the breaker than the old. This results from the fact that the incline track makes a 72-deg. turn part way up the hill instead of continuing on a straight line away from the breaker, as was the case with the old track.

One minor improvement is being considered for controlling the end of the car-track fill under the cantilever approach to the dumping and stacking machine. Instead of using wooden cribbing it is contemplated that a steel shield or plate with holes to accommodate the jack push timbers will be attached to the rear end of the frame.

The cost of this equipment installed is relatively lower than that of disposal systems handling similar material elsewhere on the property of The Hudson Coal Co. The great advantage of this latest system of disposal is adaptability to building a pile 110 ft. wide at the top instead of 10 ft., which is the limit with a shuttle conveyor if panning is omitted.

Completing the Record

To ascertain present performance, tests recently were run on the new fan installed as part of the ventilation modernization program at the Nos. 4 and 8 mines of the Union Pacific Coal Co., Rock Springs, Wyo., described by C. E. Swann, chief engineer, in the January *Coal Age*, p. 23. The fan, which serves both mines through a new 760-ft. airshaft, is now circulating 239,000 cu.ft. of air per minute against a 2.45-in. water gage. Energy consumption is 130 hp., which shows an efficiency of 71 per cent. Figures given in the article referred to above, which were based on tests in September, 1931, shortly after completion of the modernization program, were as follows: volume circulated, 200,000 c.f.m.; water gage, 2.35 in.; energy consumption, 80 hp. Rated capacity of the fan is 300,000 c.f.m. against a 3-in. water gage.

OLD-AGE PENSIONS?

+ What Part Do They Play in Meeting Problems of Old-Age Dependency?

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OLD-AGE DEPENDENCY is not a new problem, but the impact of the depression has highlighted its extent and intensified interest in a solution compatible with current concepts of society's responsibility for the welfare of the individual. This interest is reflected in the Roosevelt program for economic security and in the Wagner-Lewis bill to translate that program into federal legislation (*Coal Age*, February, 1935, p. 95). That program embraces not only old-age pensions but also unemployment compensation and government aid to dependent minors and mothers.

The present study, however, is concerned neither with the administration program as a whole nor with the merits or demerits of the particular methods proposed to achieve the objectives set up. This survey is limited to a purely factual examination of the old-age dependency problem and its background. Why is the problem more serious today? How has it been handled in the past? What are the more recent approaches to an adequate solution?

Three major factors have contributed to the gravity of old-age dependency. Modern industrial developments have increased the proportion of workers dependent upon others for a job. The swifter pace demanded by the machine age has been shortening the working life of all employees while an increasing span of physical life swells the percentage of older people in the total population. Finally, a discouragingly large number of workers do not succeed in accumulating a reserve for their declining years and many that do have their savings depleted or completely swallowed up by accident, sickness, death or other calamities.

Under modern industrial conditions, official and unofficial age limitations make it increasingly difficult for men over 40 or 45 to secure a new job. A study made in 1929 by the National Association of Manufacturers disclosed that 30 per cent of the companies investigated had definite age limits ranging from 25 to 70 years, with general agreement on 45 years for unskilled labor and 50 for skilled workers. Other inquiries support this view.[1] As a result of this trend, while 90.5 per cent of the male population between the ages of 16 and 65 was gainfully employed in 1930, only 58.3 per cent of the men over 65 was in this category.

Because the average span of life was raised from 39 years in 1840 to 60 years in 1930, the number of persons of both sexes over 65 years increased from 2.5 per cent of the total poulation in 1850 to 5.5 per cent in 1930. During this 80-year period, total population increased fivefold, but the number of aged persons increased elevenfold. In 1930, there were 6,633,805 persons in the United States who were 65 years or older.[2] Studies of the economic status of this group invariably show a substantial proportion is entirely dependent upon others for continued existence. The National Civic Federation estimates that 25 per cent of the men and 34 per cent of the women over 64 own no property at all. Other sampling surveys indicate that nearly 41 per cent of the persons over 65 years are entirely dependent.

Civilized society has evolved at least eight methods for meeting the problem. Probably the oldest and most widely practiced method is to throw the support of the aged on their kinfolk. Where this has not been possible, society has resorted to the poorhouse and other public institutions. Private benevolent agencies have offered old people's homes, but in many cases have barred their doors to the wholly indigent. A number of private organizations have assumed the burden of supplying the bare necessaries of life to old people who are physically able to take care of themselves but unable to earn their own support. None of these four methods contributes to the elimination of old-age dependency; they merely mitigate its effects upon its unfortunate victims. The methods designed to eliminate old-age dependency in whole or in part by making specific provision for the accumulation of reserves to support the aged when gainful occupations no longer are open to them include: (1) government pensions, (2) voluntary industrial pension systems, (3) trade union and other private non-industrial pension plans, and, (4) mandatory contributory pension plans.

Accurate data on the number of aged persons cared for by these various methods are not available. Rubinow[3] estimates that 1,000,000 of the total are still employed, 1,000,000 are provided with savings, 2,000,000 are living with their children, 300,000 are protected by public pensions, 100,000 draw upon private pension funds, 70,000 are in poorhouses, 80,000 in private homes for the aged, 70,000 in hospitals for mental diseases, 100,000 on outdoor private relief, and

This article is based upon a report entitled "Facts About Old-Age Security," prepared by the Committee on Social Legislation of the National Conference of Business Paper Editors and the Associated Business Papers, Inc. Studies by the National Industrial Conference Board, Industrial Relations Counselors, Inc., Epstein and Latimer and data compiled by the Bureau of the Census were the principal source materials used by the committee in its 10,000-word report.

[1] Massachusetts, 1925: A study of old-age conditions involving 2,818 men showed that only 1,486 had work; about 66⅔ per cent formerly had been employed in manufacturing industries, but less than 50 per cent worked beyond the age of 65.

National Civic Federation, 1928: Only half of the old men studied who had worked in industry were still employed.

New York State, 1930: This study showed only 1,900 out of 100,000 machinists at work in the State and only 8,000 out of 370,000 doing heavy work in transportation service were over 65 years; 14 per cent of the employed farmers, 10 per cent of the clergymen and 6 per cent of the lawyers employed, however, were over 65.

[2] Exclusive of 94,022 persons of unknown age.

[3] "The Quest for Security," by I. M. Rubinow; Henry Holt & Co., New York City, publisher.

80,000 are covered by State old-age pensions. These estimates still leave over 1,800,000 of the population 65 years and older apparently without pension coverage or other provisions for care in old age.

Limiting consideration to this smaller group, however, gives an illusory narrowness to the problem which must be faced. The swifter pace of modern industry has made the older man's hold on his job insecure. Dependence upon relatives for support and shelter is not too certain because of possible changes in the economic status of these relatives. Private homes for the aged always have long waiting lists of prospective entrants. Although the poorhouse probably is the oldest form of state assistance, the years have not erased the stigma of the almshouse to self-respecting elderly persons.

Moreover, aside from other valid criticisms, these institutions are particularly vulnerable to attack from the expense side. Experience in many States has developed that the per capita cost of maintaining an aged person in a poorhouse is three to five times as great as with a cash pension grant, which, in addition, permits the recipient to retain his independence and self-respect. Experience with outdoor public relief where grants, usually in kind and rarely in cash, are doled out from funds provided by taxation has been uniformly bad.

According to available records, voluntary industrial pension systems in North America started with the Grand Trunk Railway of Canada in 1874. The American Express Co. established a pension plan in 1875 and the Baltimore & Ohio followed in 1880. No further progress was reported in the railroad field until 1900, when the Pennsylvania launched its plan. By 1929, there were 47 railroad pension systems in operation covering over 1,500,000 employees. With over 80 per cent of the employees of Class 1 railroads covered, railroad workers are the most fully protected industrial group in the country.[4]

Pensions were inaugurated in the public-utility field in 1892 by the Consolidated Gas Co. of New York. The earliest successful plan in the manufacturing industry was established in 1901 by the Carnegie Steel Co.[5] The industrial-pension idea spread slowly until about 1905, but progress has been more rapid in the past twenty years and particularly between 1915 and 1930. At the beginning of 1930, there were nearly 400 industrial pension systems (exclusive of contributory plans) in operation covering almost 3,750,000 workers in the railroad, public-utility and general industrial fields (see Table I).

The Administration Plan

Two methods of meeting the old-age dependency problem are proposed in the Wagner-Lewis bill:

1. Outright cash grants not exceeding $30 per month financed jointly by the State and the federal government.

2. A mandatory old-age annuity system for workers financed jointly by employers and employees through taxes on wages and payrolls. Initial taxes of 0.5 per cent each would be levied on wages and on payrolls; these taxes would be increased 0.5 per cent at five-year intervals until a maximum of 2½ per cent for each tax was reached in 1952.

Critics of this plan, however, stress the inability of many industries now operating at an actual loss to assume any additional burdens and the disproportionate burden the plan places on industries where wages represent a major part of operating costs.

Ministers are among the best protected class in the country. Retirement funds, usually contributory and based on sound actuarial principles, are in operation in at least fifteen Protestant denominations. The Roman Catholic Church has no general retirement system, but all old priests are cared for, usually in the parish in which they last served. Pension plans established by trade unions for the benefit of their members have had a checkered history. A recent survey showed only eight such plans in operation with affiliates of the American Federation of Labor and three with the non-affiliated railroad brotherhoods.[6] Only a few of the 200 fraternal orders pay old-age benefits. Aside from company group insurance, annuities purchased from insurance companies have played a small part in providing against old-age dependency.

The first federal pension law for civil employees was passed in 1920. On June 30, 1932, there were 16,600 receiving old-age benefits and 5,893 receiving disability allowances, with an average annual payment per pensioner of $955. Contributions of 3½ per cent of salaries are required from the employees and Congressional appropriations make up the balances required to maintain payments. Employees' contributions for the year ended June 30, 1932, accounted for $32,000,000 of the total income of $61,000,000; expenditures for the year were $27,500,000 and the balance in the fund was $223,600,000. Perhaps the largest and most expensive old-age pension system is that covering war veterans and members of the regular military establishment. In 1932, there were 438,000 persons on the pension rolls and $233,000,000 was spent on them.

Most States have pension plans which cover normally only permanent employees such as judges and teachers. A few are on a contributory basis. Only eight States[7] have adopted pension plans for State employees generally. The first was inaugurated in Massachusetts in 1911 and since then less than 4,000 persons have received pensions in the eight States. New York City started pensions for policemen in 1857. Between 400 and 500 American cities now provide pensions for policemen and/or firemen and a few give coverage to all municipal employees. At the present time there are approximately 100 plans in operation covering about half of the public-school teachers of the country. In addition, more than 10,000 teachers in higher institutions have annuity contracts through a Carnegie Foundation.

The first State old-age pension law was passed by Arizona in 1914 and was promptly declared unconstitutional. No further action was taken by any State until 1923, but by the end of last year 28 laws had been enacted. Major provisions of these statutes are summarized in Table II and the number of pensioners receiving benefits therefrom is shown in Table III. All these laws involve outright grants from funds raised by general or special taxation. Aside from the requirement that the recipient shall be a citizen of the State for minimums ranging from 5 years in Delaware to 35 years in Arizona,[8] the essential qualification for participation in the benefits of these grants is necessity.

While these laws provide a happier and less costly substitute for the ignominy of the poorhouse, in no sense can they be said to offer relief from old-age dependency based upon past earning power such as is contemplated under Title III of the Wagner-Lewis bill. This section of the proposed security program calls for a tax upon payrolls and upon wages for the accumulation of funds out of which to pay retirement annuities.[9] The nearest counterpart to this contributory plan is found in some of the man-

[4]A mandatory pension law was enacted at the last session of Congress. This act, which is now before the Supreme Court, provides for compulsory retirement at 65 or, by mutual agreement, at 70 years. Annuity funds would be raised by a 2 per cent tax on wages and a payment of double that amount by the employer, subject to increases in the same proportion if funds prove insufficient.

[5]Alfred Dolge, a felt manufacturer, pioneered in 1882 and the Solvay Process Co. followed ten years later, but both plans became inoperative before the end of the century.

[6]The A. F. of L. unions are: Bricklayers, masons and plasterers; bridge and structural iron workers; carpenters and joiners; electrical workers; printing pressmen; street and electric railway employees; and the international typographical union. The railroad brotherhoods cover locomotive engineers, trainmen, and firemen and enginemen.

[7]California, Connecticut, Maine, Massachusetts, Minnesota, New Jersey, New York and Pennsylvania.

[8]Between these two extremes are six States requiring ten years of citizenship and residence in the State, nineteen States putting the minimum at fifteen years and two at twenty years.

[9]Old-age pensions of the type discussed in the preceding paragraph are covered by Title I of the Wagner-Lewis bill under which the federal government would match State contributions to pay a maximum of $30 per month to the aged needy not covered under the provisions of Titles III and IV.

datory pension laws in effect in foreign lands. French seamen enjoyed the advantages of old-age pensions as far back as 1673. Napoleon gave protection to civil servants and Liége miners; Russia began pensioning state-mine employees in 1797. Today 35 governments[10] with a total population of 600,000,000 offer old-age security to some or all of their citizens.

Some of the countries have separate plans, established in different years, for wage earners and salaried employees. Fourteen of the contributory plans cover all workers; two, all citizens; four, wage earners; six, salaried employees, and six cover special classes, such as railway, bank and public utility employees. In fourteen cases the workers, employers and the state contribute to the pension fund; in twelve, workers and employers; in three, employers and the state; in two, workers and the state and in one (Russia), only the employers. Systems covering salaried employees and special groups are financed by worker-employer contributions without state aid. Retirement ages range from 50 years for salaried employees in Chile and miners in Russia to 70 years for all workers in Portugal. Eighteen plans fix 65 as the pensionable age.

A flat rate of contribution for all workers, irrespective of earnings, is used in seven countries. Specific rates for various wage groups or percentages of actual earnings are the bases in the other national plans. Government contributions vary widely: some countries grant subsidies based on estimated need of funds; some on the basis of pensions paid; some, a flat sum per worker or per wage group; one, a percentage of wages. In most foreign countries, attainment of a specified age and the payment of a specified number of contributions (usually the equivalent of 200 weeks or more) are the chief requirements for receipt of pensions.

The total amount annually paid each pensioner is largely dependent upon the economic and social conditions prevailing in each country. In Great Britain and northern Ireland it is £26 (about $127.40); Roumania and Uruguay also pay flat sums. Germany pays wage earners 240 marks (about $96.60) plus an annual bonus of 20 per cent of all contributions the employee has made to the fund since 1924; German salaried workers receive 480 marks plus 15 per cent of their contributions since 1928. Similar plans are used in Czechoslovakia, Greece, Hungary, Italy and Luxemburg. Austrian, Bulgarian, Dutch and Polish payments are based on wages paid plus a supplemental bonus for the length of time specified wages have been paid. Belgium, Chile, France, Spain and Sweden base payments on the value of the contributions; Russia pays 50 per cent of the monthly wages earned during the year preceding retirement; in Portugal, workers who join the plan before they are 45 years old retire on full pay.

Retirement ages under the non-contributory plans in effect in ten countries range from 55 years in Greenland to 75 years in Newfoundland, with five plans fixing 70 years. The amount of the pension paid is based on need and varies to supplement any other income the pensioner may have. Persons with an annual income in excess of £39 5s. are ineligible for this type of pension in the Irish Free State; in New Zealand, the bar is not raised until the income passes the £80 mark. Maximum pensions payable range from $50 per year in Newfoundland to $240 in Canada.

[10]These governments and the year or years, in parentheses, in which the plans were established are: Austria (1912), Belgium (1924 and 1925), Bolivia (1926), Brazil (1923), Bulgaria (1924), *Canada except New Brunswick and Quebec (1927), Chile (1925), Cuba (1921), Czechoslovakia (1924 and 1929), *Denmark (1891), Germany (1889 and 1911), Great Britain (1908* and 1925), Greece (1923), *Greenland (1926), Hungary (1928), Iceland (1909), *Irish Free State (1908), *Isle of Guernsey (1926), Italy (1919), Lithuania (1922), Luxemburg (1911), Netherlands (1913), *Newfoundland (1911), *New Zealand (1898), Northern Ireland (1908* and 1925), Paraguay, Poland (1911 and 1928), Portugal (1919), Roumania (1912), Russia (1921), Spain (1919), Sweden (1913), *Union of South Africa (1928) and Uruguay (1919). Governments with non-contributory plans are starred; where both contributory and non-contributory plans are in effect, the year in which the non-contributory plan was established is starred. In the other cases where two dates are given, the earlier date covers establishment of a plan applicable to wage earners only; the later date, the establishment of a plan affecting salaried workers.

Table I—Industrial Pension Plans and Payments*

	1927			1929	
	Number of Companies	Pension Payments	Per Cent Payroll	Number of Companies	Number of Employees
Manufacturing	78	$10,735,000	0.63	168	1,283,200
Banking	9	89,000	0.94	45	35,700
Insurance	8	406,000	1.04	25	83,900
Mining	5	274,000	0.65	9	35,700
Railroads	39	19,149,000	0.80	48	1,572,600
Public utilities	41	3,112,000	0.37	74	697,000
Merchandising	2	22,000	1.22	15	31,900
Transportation	1	11,000	1.52	..	.....
Miscellaneous	1	3,000	1.05	13	5,400
Contributory plans	24	1,222,000	1.55	..	.....
Total	208	35,023,000	0.68	397	3,745,400

*Based on studies made by Industrial Relations Counselors, Inc.

Table II—Pension Laws in the United States

State	Date Established	Pensionable Age	Monthly Pension Maximum	Monthly Pension Average	Monthly Poorhouse Cost
Statewide Mandatory Systems					
Arizona	1933	70	$30.00	$22.81	$56.80
California	1929	70	*	22.08	44.74
Colorado	1933	75	*	7.69	42.30
Delaware	1931	65	25.00	9.84	46.24
Idaho	1931	65	25.00	8.50	47.26
Indiana	1933	70	15.00	....	36.96
Iowa	1934	65	25.00	....	....
Maine	1933	65	....	*	53.42
Massachusetts	1930	70	None	25.00	47.70
Michigan	1933	70	30.00	....	....
Nebraska	1933	65	20.00	....	....
New Hampshire	1931	70	†	17.18	44.19
New Jersey	1931	70	*	15.28	42.13
New York	1930	70	None	23.80	39.61
North Dakota	1933	68	‡	....	61.71
Ohio	1933	65	25.00	....	....
Oregon	1933	70	30.00	....	28.63
Pennsylvania	1933	70	30.00	....	....
Washington	1933	65	30.00	....	....
Wyoming	1929	65	30.00	13.88	78.74
County Optional Systems					
Kentucky	1926	70	§	**	25.44
Maryland	1927	65	*	....	40.89
Minnesota	1929	70	*	20.28	56.29
Montana	1923	70	25.00	15.55	55.19
Nevada	1925	65	*	**	81.66
Utah	1929	65	25.00	9.00	45.62
West Virginia	1931	65	*	....	38.70
Wisconsin	1925	70	*	19.27	35.63

*$1.00 per day. †$7.50 per week. ‡$150.00 per year. §$250.00 per year. **Not operative.

Table III—Number of Pensioners, Dec. 31, 1933

State	Population Of Pension Counties	Number of Pensioners	Pensioners Per 1,000 Population
Arizona	436,000	1,629	3.74
California	5,677,000	14,604	2.57
Colorado	904,000	8,139	9.01
Delaware	238,000	1,586	6.65
Idaho	347,000	1,288	3.71
*Maryland	805,000	141	0.17
Massachusetts	4,250,000	18,516	4.36
*Minnesota	1,076,000	2,566	2.39
*Montana	360,000	1,034	2.37
New Hampshire	465,000	1,131	2.43
New Jersey	3,280,000	9,015	2.75
New York	12,588,000	51,106	4.06
*Utah	338,000	944	2.79
*Wisconsin	1,029,000	1,756	1.71
Wyoming	211,000	501	2.37
Total	32,004,000	113,956	3.56

*County optional systems.

NOTES

. . . from Across the Sea

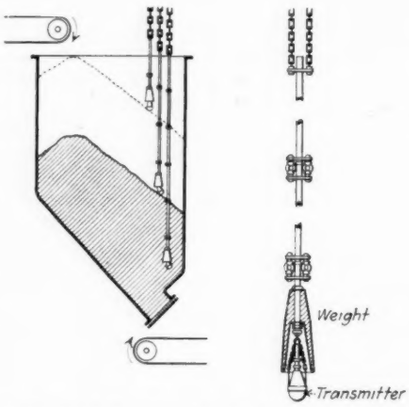
APPARENTLY, the bacteria in peat bogs change the sulphates of percolating waters to sulphides which are deposited in the peat bog, and found as a part of the resultant coal bed. Iron sulphide, or pyrites, of course, predominates, but investigation has shown the presence of lead, copper, zinc and arsenic also. J. T. Dunn and H. C. L. Bloxam, in the *Journal of the Society of Chemical Industry*, declare that the lead and copper found in the herbage and in the soil of pastures near works employing coal are derived from the pyrites in coal. Pyrites from coal seams were found almost invariably to contain lead and copper, and frequently zinc. Analyses show compounds of these metals in domestic soots and dusts and in the industrial dusts from coal furnaces. In Newcastle-on-Tyne, England, they are present also in atmospheric dust.

Organs of dead sheep, cattle and fowls were found to contain lead and copper, and the authors ascribed the deaths of such stock to the eating of herbage in the two former instances and to the presence of these metals in coal-ash heaps in the third instance. It is believed to be a contributing cause of the corrosion of galvanized surfaces and of unprotected metals. Manganese is found in pyrites up to 825 parts per million, lead up to 461 parts, copper up to 170 parts and zinc up to 80 parts. Incidentally, it may be remarked that lead and zinc compounds are found in large and commercial quantities in some of the Missouri coal fields.

Somewhat different in origin must be the presence of iodine in coal. *Engineering*, London, England, reports that F. Wald, engineer in charge of the laboratory of the Witkowitz Iron & Steel Works, Czechoslovakia, found in the ammoniated water produced in by-product recovery installations 35 grams, and in the waste water from the ammonia plant 25 grams of iodine per ton. Prof. Henry Briggs, in *Colliery Engineering*, London, England, names 45 elements found in coal. His references to the presence of vanadium in large quantities in South America must be taken with caution because of the extremely low percentage of ash, which suggests, as do facts from other sources, that the substance from which the vanadium was taken was not coal but kerite, a substance derived from oil.

THE anthracite region, which stores its coal in big pockets before loading it into railroad cars, has of recent years been interested in providing indicators that will exhibit to the loaders the level of the coal stored in the pockets. Such indicators are, in general at least, operated by breaker attendants. The Siemens-Halske Co., of Berlin, Germany, has evolved a bin-level indicator for coarse-grained material. This has had two years of continuous operation and has been found reliable.

The indicator consists of one or more contact-type transmitters suspended at various levels in the pocket. These are deflected laterally by the fall of the contents of the pocket down the sides of the coal pile. Lamps connected in



Coal-Level Indicator in Pocket (Left) With Detail of Indicator (Right).

the circuits of the contacts are arranged on a panel, and where, for instance, there are three contacts, glow signals show whether the pocket is empty, half full or completely filled. A siren, which can be switched off, can be used to draw attention to any of the indications. Mercury contacts in the transmitters close the circuit if tilted ever so slightly in any direction. The transmitters, which are pear-shaped, are suspended by means of chains from a weight which in turn is suspended by a rod and two chains. The weight protects the transmitter from the pressure and friction of subsiding coal.

CUTTING total water gage from 6.2 to 1.9 in. while still receiving its original ventilation current of 45,000 cu.ft. of air per minute was an economy effected at the Park Mill colliery, in West Yorkshire, England. This improvement, described at a meeting of the Midland Institute of Mining Engineers, was attained by the sinking of a shaft so as to convert return to one-way ventilation over a large part of the mine and by enlarging and smoothing the main airway. The mine has two seams, one 22 in. thick and one 30 in., lying at relatively shallow depths.

By air surveys it was discovered that 75 per cent of the total water gage of the fan was wasted in the 3,500-ft. length of the return airway thus surveyed, and that 37 per cent of the air produced by the fan leaked apparently in the first 500 ft. of its horizontal travel. (The article shows an upcast, now used as an intake, so some of this air may have been lost in the shaft leading to the fan.) Nothing is said about using the erstwhile return as an additional passageway for the main air current, but if so used it would be relatively ineffective because of its condition and irregular course, for it crossed the main airway at six points.

This is an extreme case and a new shaft had to be sunk, which was of value because it shortened the travel of the men to their work, but there are occasions innumerable in this country where this method of preventing leakage and reducing resistance could be introduced with great profit. In some cases the air can be taken in or driven out at crop falls and in others inexpensive shafts can be sunk, or, as was suggested by one of the commentators, shafts could be used in mines adjacent, especially where amalgamation of adjacent properties makes it possible to treat the two operations as one.

TROUBLESOME as is crosscut driving, the expedient developed in Upper Silesia seems, at first sight at least, an inadequate answer. There, holes of 12½-in. diameter are drilled through pillars to replace crosscuts. The equipment, as described in the *Technische Blätter: Wochenschrift zur Deutschen Bergwerks Zeitung*, consists of a boring tube built up of lengths of steel tubing 5 ft. 4 in. long, 11½-in. inside diameter and 0.08 in. gage. On the fore end of the tube is mounted a boring cutter tipped with four or five pairs of tungsten-carbide bits, which project slightly beyond the casing, inside and out, so that the borehole is about 12.6 in. in diameter and the core about 11.2 in. The outer boring jacket of the tubes has a worm for removing the dust from the borehole. As no part weighs more than 220 lb., the dismantled machine can readily be removed from place to place by two men.

It may be used either for ventilation drivages or for undercutting. In the former case the holes drilled may be 40 to 50 ft. long, and in the latter the holes may be 13 to 19 ft. long. The feed of the machine is about 8 in. per minute. Where an entry or room has to carry only a small quantity of air, only an inconsiderable loss of air pressure would occur in such a crosscut hole, especially as such holes might be more frequent than is customary with large-size crosscuts, and two or more of these be left open at one time. Where air is not taken to the face by line brattice and crosscuts are placed 90 ft. apart, a holing of this kind

would immeasurably assist in promoting ventilation. The system has the advantage that the pillars retain most of their strength and the hole can be completed in one or two hours, and at any elevation.

CARBON MONOXIDE will completely disappear in the presence of oxidized damp coal, declared J. Ivon Graham, before the Society of Chemical Industry, London—a comforting fact for those who seal up fires with the carbon monoxide they generate. The degree to which that elimination will occur, of course, will depend on the oxidation of the coal and its dampness. In this country it has been thought that leakage of carbon monoxide occurred from imperfectly sealed but extinct fires and perhaps the notion is not without justification. But it is cheering to learn that carbon monoxide is disposed to take an atom of oxygen from damp coal.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Where no price is appended in the notice of a publication of the U. S. Bureau of Mines, application should be directed to that Bureau. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

The Use of Treated Mine Ties and Timbers in Illinois and Indiana Coal Mines, by C. A. Herbert. Information Circular 6797, U. S. Bureau of Mines, Washington, D. C. 6 pp.

That $1,500 a year per mile of track can be saved by using treated ties is the opinion of the author. If the desired life of a timber set is 15 years (assumed life of treated timber), seven replacements of untreated timber, in addition to the original setting, will be necessary, compared with one setting of treated timber. With these assumptions, cost per set for untreated timber will be about $25.60, compared with $5.20 for treated timber.

Creosote and zinc chloride are said to be the principal treatments in the United States. Creosote irritates the skin, and many workmen, therefore, object to handling creosoted timber. This objection, however, is largely overcome by removing the surplus creosote at the time of treatment and then stacking the treated timber in open storage piles long enough to allow the volatile oil on the outside of the timber to dry off or escape before use. After treated timber has been thus stacked, it is little, if any, more inflammable than untreated sound timber, and much less inflammable than untreated decayed timber. Zinc chloride, although not as toxic as creosote, gives good results, particularly where there is not enough moisture to leach the salt. It does not irritate the skin, is thought to be slightly fire-resistant, does not discolor the wood and may be used where the wood is to be painted, as in surface buildings.

Service records in certain mines in the anthracite field of Pennsylvania indicate that treated timber has an average life of about twenty years. The evidence is conclusively in favor of treated mine ties and timber where a life of more than two years is desired. Treated ties of cheap hardwoods appear to give almost as good service as the more expensive kinds; gumwood is the most favored because of its greater resistance to mechanical wear. Pine ties usually are badly cut and splintered from wheel flanges when cars or locomotives are derailed. If the ties are treated only to the depth of the sapwood, the rails will cut through the impregnated material and permit rot to enter the heartwood. If mine timber cannot be cut and framed before impregnation, the unimpregnated timber exposed by such cutting or framing should be given several brush coatings of preservative before the timber is placed, or spores will enter through the exposed surfaces and decay occur.

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Thermal Decomposition of a Coal in High Vacuum, by B. Juettner and H. C. Howard. Coal Research Laboratory, Carnegie Institute of Technology. Contribution 8; paper, 22 pp.

Under a high vacuum, low-temperature distillation produces different condensable material from that produced under normal pressures. The former material is semi-solid and yellow to brown; it contains small quantities of volatile matter, and about 30 per cent of it consists of various "neutral ether insoluble" bodies with an average molecular weight of 400. On the other hand, the latter material is black, contains relatively large quantities of volatile matter and only 15 per cent of neutral ether insoluble bodies. It is suggested that these bodies are the source of simpler phenolic bodies, formed by heat at normal pressures, for the yield in the case of distillation in a high vacuum is low in phenolic bodies and high in neutral ether insoluble bodies. Edenborn (Pa.) coal was used at temperatures from 350 to 525 deg. C. and at pressures from 10^{-2} to 10^{-3} mm. of mercury.

The neutral ether insoluble bodies are only slightly soluble in benzene, unlike the neutral ether soluble bodies, but are readily soluble in a mixture in benzene and alcohol or, in general, in a solvent combining an aromatic ring and a hydroxyl group, such as benzyl alcohol, cresol, phenol and phenyl ethyl alcohol. One finds it difficult to reconcile the statement of the average molecular weight of 400 with the declaration that ether insolubles from vacuum distillation in their simplest empirical formula would be represented by $C_{22}H_{22}O_8$ with a molecular weight of 496. It is recognized by the authors that the material thus represented is far from homogeneous.

It is perhaps profane and speaking out of turn to suggest of this fundamental research that the agglutinating qualities of these condensates might have been studied to see how desirable they would prove for briquetting and Bakelite and to wonder whether some of the effect could have been obtained at vacuums much less complete.

—❖—

Coal Mine Haulage in West Virginia, by D. L. McElroy. Research Bulletin No. 11, Engineering Experiment Station, West Virginia University. 146 pp., eleven supplementary tables.

With the increased stress on efficiency growing out of the shorter working day, this bulletin comes out at an auspicious time. While primarily devoted to a report on the results of a study of haulage conditions, systems and performance at 42 coal mines in West Virginia, including labor costs in man-hours per ton, per ton-mile and per car-mile, principles have not been neglected; the bulletin includes not only a critical discussion of the various factors influencing haulage performance, as reflected in results at the various mines, but also an analysis of the time-study method of detecting haulage faults, with specific examples of its application.

Arrangement of the principal subject matter in the bulletin follows the natural division of underground transportation into the following classes: gathering haulage (including both locomotives and stock gathering from hand and mechanical loaders); main-line haulage, including relay haulage where encountered; and shaft- and slope-bottom layout and operation. Supplementary sections include a discussion of the relationship between seam thickness, labor cost of transportation in man-hours per ton, car capacity in use per loader, cars in use per loader, car turnover and tons per loader per shift; haulage as a source of injuries to personnel; and the development of mine haulage in West Virginia.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

■

Primary Starting of Converter Adopted To Utilize Automatic Board

ARRANGING equipment for starting a rotary converter on the primary side of the transformers instead of on the secondary made practical the use of a spare automatic motor-generator control board to change a converter substation unit from manual to full-automatic control at a Pennsylvania Coal & Coke Corporation station, reports E. J. Lynch, power department, Cresson, Pa. Manufacturers who were consulted regarding adapting the 300-kw. motor-generator control board for use on a converter of the same size reported they knew of no cases where primary side starting had been used and advocated the use of an expensive secondary contactor.

Coal company engineers could see no difficulty with primary starting and so proceeded to make the change. Additional apparatus included a field discharge resistance in place of the field break-up switch; a brush-lifting device; and a Rectox for bringing generated voltage to correct polarity. As the d.c. and a.c. voltages of a rotary converter always are in a fixed ratio it was necessary to rewind several coils so that they would pull in at a much lower voltage than that delivered by a motor-generator set; but at the same time it was necessary to install additional contacts which would insert resistance in series with these coils when on full operating voltage.

If a Rectox of sufficient capacity to rectify the field with the discharge resistance in parallel with the same were used it would have been very expensive, consequently two field discharge resistors, with contactors, were installed in parallel. Both are across the field at the instant of starting, when the greatest danger of excessive voltage on the field is encountered, but one of these resistors is disconnected automatically from across the field just before the Rectox is applied.

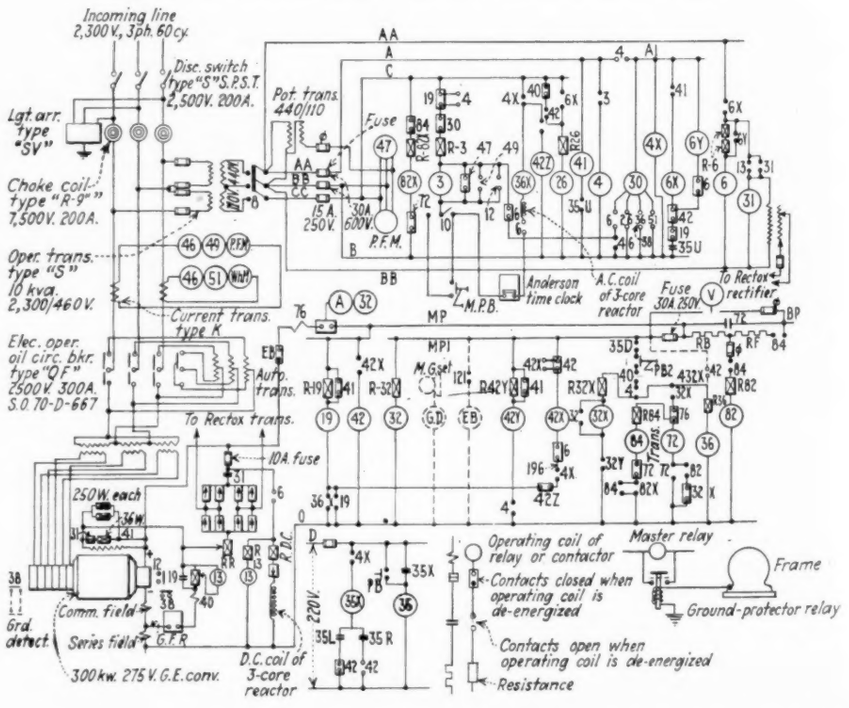
Because of the great danger from overspeed in case of the reversal of a rotary converter, an additional d.c. breaker was installed in the positive line between the machine and the board. The overload trip of this breaker is replaced by a shunt trip which receives its current from a reverse-current relay. The overspeed device was left to operate the main d.c. breaker as normally arranged.

In all substations of the company the machine base itself is not grounded by a permanent heavy conductor for the reason that such grounding makes it difficult to protect the windings in case of a breakdown to ground. Instead a ground detector relay is installed with operating coil

Resistance Table

Res.	Req.	Type	Inches	Ohms	Style No.
R-3	1	Tube	10	100	250271-A
R-19	1	Tube	6	1250	232235-A
R-26	1	Tube	10	40	250267-A
R-32	1	Cage	...	....	Newark
R-32X	..	Tube	8	1100	250892-A
R-36	1	Cage	...	....	Newark
R-42X	1	Tube	6	500	245298-A
R-42Y	1	.....	...	1500	186468
R-82	1	Tube	6	1250	232235-A
R-82X	1	Cage	...	....	Newark
R-84	1	Tube	6	500	245298-A
RB	1	Ribbon	212	4.8	245730
RF	1	Ribbon	212	4.8	245730
R-6	2	Reactance	...	....	286044
R-13	1	Tube	10	640	204657-A
R-DC	1	Tube	10	2000	317210-A
RR	1	M	...	15	S.O. 10-F-886
R-40	1	TM	...	112	

Wiring of Converter Control Including Ground Protector Relay



List of Apparatus

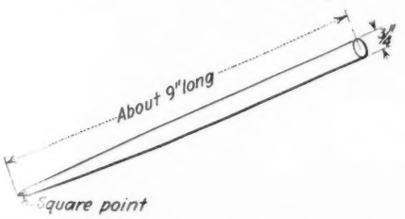
No.	Type	Description
3	20F	Master relay
4	32F	Master control contactor
6	QF	Starting breaker
6X	32F	Starting breaker control relay
8	A	Control power switch
10	A	Change-over switch (auto to continuous)
19	30-C	Transfer relay
26	Cart.	Auto. transformer protective relay
30	JL	Annunciator lockout relay
32	D	D.C. reverse current relay
32X	30-C	Aux. reverse current relay
36	A	Polarity relay
38	HM	Bearing thermostat
40	30-C	Field failure relay
31	32-F	Field flashing contactor
36X	CV	Aux. polarity relay
42	QF	Running breaker
42X	30-C	Running breaker control relay
42Y	....	Running breaker low-voltage release
46	CQ	Phase balance current relay
47	CP	Single and reverse phase voltage relay
49	BA	Thermal overload relay
51	CO	A.C. overload relay
72	C	D.C. machine contactor
76	KN	D.C. overload relay
82	Prim.	D.C. reclosing relay
82X	CV	D.C. reclosing time relay
84	300	Generator relay
12	....	Overspeed limit device
6Y	32-F	Starting breaker aux. relay
42Z	MC	Running breaker aux. relay
13	30-C	Synchronous speed device
35	....	Brush lifting device
35X	30-F	Control relay for device 35
4X	MC	Aux. relay to device 4
G.D.	....	Ground detector
E.B.	....	Emergency overspeed breaker
32Y	....	Aux. reverse current relay

inserted between the machine base and ground and with operating contacts across the master relay, which, when shorted by any of the protective devices such as overspeed switch, single and reverse phase relays and thermal overload relay, opens the main a.c. breaker. Current equivalent to that required to light a 40-watt 250-volt lamp will operate this ground protective device. It is impossible to receive a shock from the machine frame to ground because of the connection through the relay coil.

Starting Spikes

To facilitate starting wire nails or spikes 5 or 6 in. long in unusually hard wood without bending, Charles W. Watkins, Kingston, Pa., offers the square-pointed punch shown in the accompanying illustration. The punch consists of a solid piece of steel about 9 in. long and ¾ in. in diameter at the large end, tapering to the desired diameter at the small end. Length of the tapered section should be approximately 4 in., and a square point with four cutting edges should be formed on the end. For hard wood 3 in. or more thick, the point should be driven in about ⅜ in., after which, says Mr. Watkins, the point of the nail or spike should be rubbed in oily cotton waste or dipped in a lubricant. The hole made by the punch serves as a guide and the lubricant reduces friction.

Facilitates Driving of Spikes.



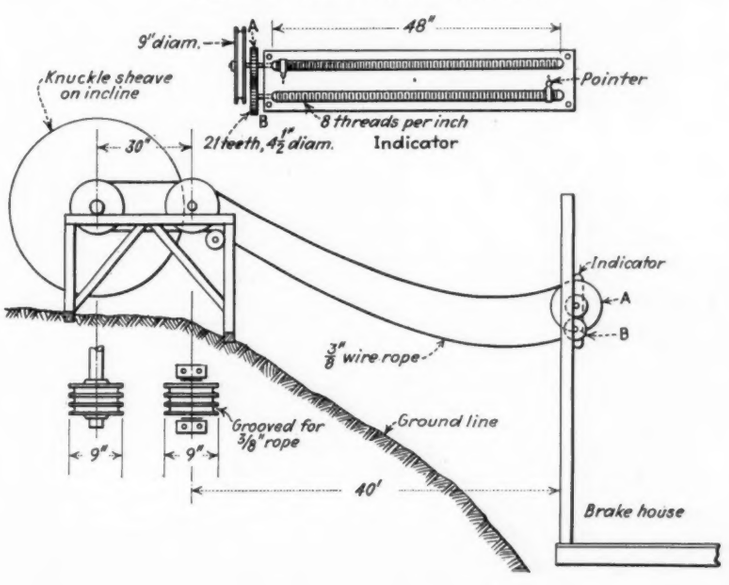
Skull Practice

Given time, a man can work out a good solution for almost any problem, but even here it is wise to take advantage of the experience of the other fellow and thereby reach the goal with a minimum of lost motion. Where answers are required on the spot, however, the picture changes, and a ready-made solution may mean the difference between a gain and a loss. In the light of these statements, preparation for the every-day problems encountered in coal-mine operation might be boiled down to a judicious mixture of skull practice plus an eye to current developments. This department can offer little assistance in the matter of skull practice, but it does try to present tried and proved short cuts for operating, electrical, mechanical and safety men. If you have originated such an idea, it belongs here. So send it in, together with a sketch or photograph if necessary for clearness. Acceptable ideas will bring their sender $5 or more each.

Indicator Shows Car Position On Long Incline

An indicator has been found to be a necessity on the 3,600-ft. incline of the Diamond Coal Co., Petros, Tenn., A. W. Evans, chief mine inspector for Tennessee, points out in submitting a description, inasmuch as vision is limited to 400 ft. on foggy days. The indicator drive (see accompanying sketch) includes two 9-in. sheaves in tandem on 24-in. centers, the rear sheave being mounted on the shaft of the main knuckle sheave over which the incline rope passes. A ⅜-in. wire rope reeved over these two sheaves is extended to the brake house to drive the two threaded rods carrying the position indicators, or pointers. These rods are cut with eight threads per inch, and the pointers have a maximum travel equal to the length of the rods.

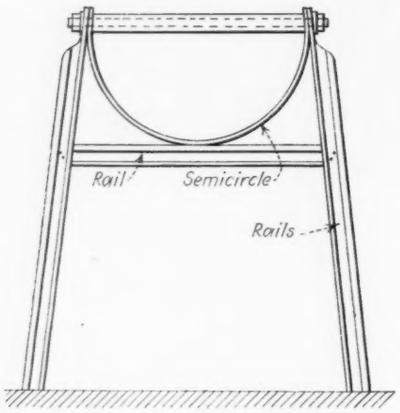
Details of Incline Position Indicator.



Steel Flumes Carry Water Over Surface Cracks

Because of the frequency with which the wood flumes of the Lehigh Navigation Coal Co. were burned by forest fires, destroyed by persons traveling over them and cutting them with axes for firewood or rotted by alternate wetting and drying, that company recently decided to use half-round steel flumes in 12- to 30-ft. lengths for carrying water over crop falls. The flumes are constructed of steel plates ⅜, ¼ and 5/16 in. thick, the thickness depending partly on the pipe diameter and partly on the time the flume is likely to be in service. About 8,000 ft. of such half-round steel flume has been installed by the company, some single flumes being 1,000 ft. long. Diameters range from 24 to 54 in.

The sections are connected by ⅝-in. rivets countersunk in the upper plate. Where a flume passes over a ravine, it is supported on bents consisting each of two inclined vertical members with a crossbar just under the bowl of the flume, all made of rail, and a pipe distance piece above the flume with a threaded bolt, or rod, passing through the pipe and tightened with burrs against the end of the pipe so that the flume cannot be drawn too tightly together at the top or tend to spread. These bents are set at about 15-ft. centers. The entire

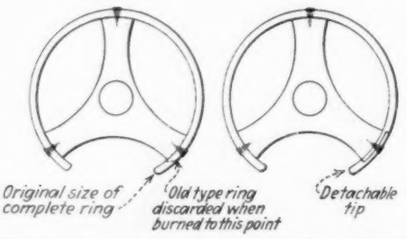


Steel Flume Carries Surface Water Over Ravines Fractured by Mining.

structure is protected by a heavy coat of asphalt paint. As the curved plates come nested inside one another and are so transported to the place of use, little volume of material has to be handled as compared with wooden flume. The plates also are relatively light.

Detachable Tips Lengthen Life Of Controller Rings

Use of detachable tips is proposed by Charles H. Curry, Wyano, Pa., to lengthen the life of drum-type controller rings. Ordinarily, Mr. Curry points out, the rings must be discarded after the tip has been burned off in service, although the remainder of the ring is in good condition. This loss is prevented by employing a detachable tip, which represents no great cost when discarded. When carefully installed and maintained, little resistance is offered to the flow of current.



Showing the Part of Controller Ring Affected by Burning and Detachable Tip in Place.

Concrete for Mine Use

Selection of materials is the first point taken up in the rules for making concrete included in "Less Cost Per Ton With Concrete," a publication of the Portland Cement Association. "Water for mixing concrete should be free from oil, acids and alkalis. Water fit for drinking should be used.

"Concrete usually is made with a combination of fine aggregate (sand) and coarse aggregate (gravel, crushed stone or slag). The aggregate should consist of clean, hard, sound and durable particles, and should be free from fine dust, shale, slate, clay and vegetable matter. Aggregates sold by reliable producers and which have been screened and washed are preferred. Slag for aggregates should be air cooled and free from metallic iron, and should weigh at least 70 lb. per cubic foot.

"All aggregates should be graded—that is, they should contain all sizes from the finest to the coarsest, with the coarse particles predominating. Sand should be graded from 0 to ¼ in., and the coarse aggregate from ¼ in. to the largest size. Usually about 1½ in. is the maximum for general purposes. In no case should the aggregate be larger than one-fifth the narrowest dimension between forms, nor larger than three-fourths the minimum clear spacing between reinforcing bars.

"It is essential to protect cement from moisture until ready for use. It may be stored in a dry room or on a raised platform under watertight cover. In a damp mine, storage should be limited to the cement required for one day. Fine and coarse aggregates should be kept in separate stockpiles. They should not be stored on loose dirt which will become mixed with the aggregates.

"While there are many factors affecting the quality of concrete, the most important of these is the quantity of mixing water. Too much water dilutes the cement paste, making a weak, porous concrete. The less water used, the stronger, more watertight and more durable will be the concrete. Any quality of concrete can thus be obtained by controlling the quantity of mixing water.

"For practical purposes, two classes of concrete are suggested for mine structures: Class A, in which the mixing water does not exceed 6 gal. per sack of cement, and Class B, in which the mixing water does not exceed 7½ gal. Class A concrete should be used in all cases where the structure must be watertight or where conditions of exposure are severe. Class B concrete should be used for general-purpose structures. The quantities of water include the surface moisture on the aggregates, which must be subtracted to determine the correct quantity of water to be added to each batch. On important work, the moisture is determined by test (drying and weighing a sample of the aggregate), but fairly accurate estimates may be made. For damp sand which feels damp but leaves little moisture on the hand, deduct ¼ gal. per cubic foot of sand. For wet sand which looks and feels moist, deduct ½ gal. For very wet, dripping sand, deduct ¾ gal." Mixing water and approximate proportions of fine and coarse aggregate to produce concrete of medium consistency are shown in the accompanying table.

"The proportions of fine and coarse aggregates shown in the table are approximate only, and should be adjusted until a mixture of the workability required for the job is secured. A general-purpose concrete is plastic-looking, yet can be heaped upon a shovel. A stiff concrete can be used in floors and massive work, while a more fluid mixture is necessary for narrow walls and thin sections. In no case should the mixture be so stiff that stone pockets will occur in the concrete, nor should it be so fluid that the material separates and water comes to the surface after the concrete is placed. In making adjustments in the consistency, the quantity of mixing water should not exceed the quantity specified for each class of concrete. Experience has shown that for average materials on average work the best ratio of sand to stone will be approximately 40 per cent stone and 60 per cent coarse aggregate.

"Forms should be substantial and sufficiently tight to prevent leakage of mortar. They should be properly braced or tied together to maintain position and shape. Special form ties or tie wires may be used, but no metal should be left closer than 1 in. to the surface of the concrete. Mechanical mixing should be used whenever possible. A number of mines now employ a one-bag mixer mounted on mine trucks. For ordinary work, concretes should be mixed one full minute. For watertight concrete, 1½ minutes is essential, timed from the moment all materials, including water, are in the drum. When hand mixing cannot be avoided, use a watertight platform. Mix all materials dry first, add water, and continue mixing until the mass is uniform in color and every stone particle is well coated with cement paste.

"Concrete must be placed before it begins to stiffen, usually within 45 minutes. Forms should be clear of all débris and thoroughly wetted. For walls, place in level layers about 6 in. deep. Concrete should be placed where it is to stay, not raked along and spread out. Thorough spading is necessary to insure a good surface and a thorough bond with the reinforcing. For watertight concrete, it is extremely important that a good bond be obtained with the previous day's run, or wherever concreting is interrupted. The concrete should be roughened and cleaned before it hardens. Just before resuming operations, the hardened concrete should be slushed with a thick cement paste.

"It is essential that concrete be kept moist to obtain the maximum density, strength and watertightness. Forms should be left in place for at least a week, where practicable, to prevent loss of moisture; otherwise, the concrete should be kept wet during the time. This precaution is especially important in the presence of dry ventilating air or wind and sunshine."

On the subject of "guniting," the publication points out that certain contractors, through long experience, are able to produce a satisfactory job even under very difficult conditions resulting from seepage or even flowing water where a mine crew might not. For the average job, however, a "cement gun" operated by a mine crew offers an economical means of maintaining ribs and roof, or of making repairs of various types.

"The gunite mixture usually consists of one part of portland cement and three parts of sand by volume. Materials are mixed by hand and passed through a ⅜- or ¼-in. sieve before using. The sand should contain from 3 to 6 per cent of moisture. Water ordinarily should be limited to 3 or 3½ gal. per sack of cement. The proper consistency can be determined by careful trial. Guniting requires 100 to 225 cu.ft. of free air per minute at pressures of 30 to

60 lb. per square inch in the gun chamber. Water pressure should be about 15 lb. higher than air pressure. A hose length of 50 to 150 ft. is recommended for best operation, although hose lengths up to 450 ft. horizontally and 250 ft. vertically are possible. The following suggestions will aid in obtaining best results:

"Be sure surface to be gunited is free from dirt, dust, oil or other foreign matter and that all loose or weakened material is removed. I-beams to be incased must be cleaned of paint and rust scale.

"Rebounding sand accumulating in pockets or on other surfaces near the guniting operation should be removed before the surfaces are covered. Material which rebounds seldom is sufficiently well graded to reuse in important work.

"Preliminary sandblasting with the gun often will improve bond.

"Proper air and water pressure must be maintained at all times to insure good-quality work.

"Thickness of the coating should be checked frequently as the work progresses, and never should be less than 1 in.

"Proper curing is as essential for gunite as for other types of concrete. It must be kept moist for at least seven days after placing.

"Near portals, in down-cast shafts and in other places where there is danger of freezing, fresh gunite must be given the same protection as concrete. Gunite never should be applied to a surface coated with ice or frost.

"At construction joints, gunite should be sloped off to a thin edge. Before resuming application, thoroughly clean and wet the sloped portion to insure good bond. No square joints should be allowed.

"An experienced and careful nozzleman is the key to good guniting."

Recommended Concrete Mixtures

Class A Concrete (6 Gal. Water)

Structure	Gallons of Water per Sack of Cement in Batch if Sand Is			Approximate Mixture for Trial Batch*		
	Very Wet	Wet	Damp	Cement, Sacks	Sand, Cu.Ft.	Coarse, Cu.Ft.
Coal hoppers; dipping tanks, portals and entries subject to water pressure; pump pits and sumps; scale pits in wet ground; settling, storage and thickener tanks; shafts and shaft bottoms; stacks, slopes, pavements and runways; thin reinforced members exposed to weather.....	4½	5	5½	1	2½	3
Class B Concrete (7½ Gal. Water)						
Arches, foundations for bins and conveyors; fan houses, hoist houses; overcasts; points and Y's; portals and entries; pump-rooms; repair shops; sand bins and dryers; stables; stoppings; substation walls and supports; tipples; walls...	5½	5¾	6¼	1	3	4½

*If mixture is too fluid, add aggregates; if too stiff, use less aggregates. In no case should the quantity of water be changed.

Equalizers Built at Mine Modernize Locomotives

When an item of equipment at the Ansted mines of the Gauley Mountain Coal Co., Ansted, W. Va., gives repeated trouble there is a search for the fundamental cause and next an unrelenting effort to improve the equipment so that the difficulty is unlikely to occur again. In practically every instance it has been found possible to improve parts of equipments that did not stand the service. The mine locomotives at Ansted furnish an example of such improvement and show how one revision may bring out difficulties that did not before appear on the surface.

These locomotives, mostly ten years or more old, were brought into the shop and rebuilt to eliminate excessive play, which was causing a high maintenance cost. But because of a rather long wheelbase and a narrow track gage they would not stay on the tracks when thus made properly rigid. The solution appeared to be the addition of an equalizer and accordingly experiments were begun to develop a trouble-free type which could be applied with minimum changes to the structure of the locomotive.

The illustration shows a perfected equalizer applied to a 10-ton Type 122 locomotive. The bell-cranks against which the journal springs rest are in pairs, one on the inside of the frame and one on the outside, and are pivoted on the same shaft. Also on the inside of the frame is a duplicate tie bar. In the first design tried there was but the one outside tie bar, but that design proved unsatisfactory because it was difficult to keep the bell-cranks locked against turning on the pivot pin. With this bell-crank arrangement, as illustrated, a locomotive that is rigid and close fitting shows no tendency to derail.

A different design, however, was necessary for certain of the locomotives that are used in low coal. The frames of these were not of sufficient height above the axle to allow space for the coil spring and bell-crank, so both of the journal springs are eliminated and a single spring is built into the tie-bar connection. The locomotive frame is cut away to allow placing the spring midway between bell-cranks with its center line on the center line of the frame section. The spring unit, which is about twice the length of a journal spring and consists of two coil springs, one of smaller diameter and set inside of the other, is arranged between double yokes which place the unit in compression when the ties to the yokes are under tension.

In both the high- and low-type locomotives one side only is equipped with an equalizer. W. I. Dalton, chief electrician and master mechanic, is responsible for the design.

Maintenance Costs Average 28 Tons Per Man-Hour

Comparisons of maintenance costs with those of other mines form a basis for determining approximately the reasonableness of the costs, provided factors wherein the mining conditions and equipments differ are properly weighed. Repair-material price changes introduce a difficulty in making comparisons for successive periods even at a single mine. Changes in labor rates introduce still another variation. But if data on the labor item are compiled on a man-hour basis matched against mine tonnage the result provides a comparison not affected by changing prices. One bituminous producing company having mines in several localities started somewhat over a year ago to compile maintenance labor in that manner. The average figures for several months now provide a basis for comparisons.

In the case of this company, however, the figures are tons of coal produced per man-shift (seven hours) of all labor engaged in equipment maintenance. Central shops, car repairing and lubrication are included, but track maintenance is excluded. The average for all mines is 195 tons and the lowest and highest figures for groups of mines are 131 tons and 287 tons. Reduced to the man-hour basis, the average figure becomes 28 tons and the limits 17.7 and 41. These latter figures are the quotients obtained by dividing tonnages by total man-hours of all maintenance men in the corresponding periods.

Equalizer on a 10-Ton Locomotive

WORD from the FIELD

Bureau of Mines Funds Higher? Advisory Board Named

An increase of $202,385 in the appropriations for the Bureau of Mines has been recommended by the Appropriations Committee of the House of Representatives. This would make $1,417,311 available for the work of the Bureau during the next fiscal year. For mineral mining investigations the committee recommended $128,860, which is $42,886 more than the 1935 appropriation and is an increase of $30,000 above the recommendation of the Bureau of the Budget. The committee increased the item so as to allow an expansion of the work in connection with geophysical methods of prospecting. So as to provide for additional work on the beneficiation of ores and coal in the Pacific Northwest and Alaska the committee added $5,000 to the appropriation for the mining experiment station, bringing the total for that purpose to $140,450.

A total of $2,107,560 was recommended for the Geological Survey, an increase of $794,060 over the appropriation for the current fiscal year. This practically brings the appropriation back to the pre-depression level. The committee added $10,000 to the budget estimate for geological surveys, making $335,000 available for that purpose.

Dr. John Wellington Finch, Director of the Bureau of Mines, states that he is gratified to announce the personnel of a new Bureau of Mines Advisory Board which he has just set up. Twenty years ago, he points out, it would have been impossible to induce representatives of industry and labor to sit down around the same table to discuss such problems as come before the Bureau. The personnel of the board and the groups represented are as follows:

Eastern Bituminous Producers—J. P. Williams, Jr., president, Koppers Coal & Transportation Co., and president, National Coal Association; L. E. Young (alternate), vice-president, Pittsburgh Coal Co.

Anthracite Producers—Louis C. Madeira, 3d, Anthracite Institute; Cadwallader Evans, Jr. (alternate), Hudson Coal Co.

Western Bituminous Producers—Eugene McAuliffe, president, Union Pacific Coal Co.; D. S. Hanley (alternate), vice-president, Pacific Coast Coal Co.

Mining Employees—John L. Lewis, president, United Mine Workers; A. D. Lewis (alternate), United Mine Workers; William Green, president, American Federation of Labor; Thomas H. Brown (alternate), president, International Union of Mine, Mill and Smelter Workers.

Oil and Gas Field Workers—H. C. Fremming, president, International Association of Oil Field, Gas Well and Refinery Workers; John L. Coulter (alternate), secretary-treasurer, International Association of Oil Field, Gas Well and Refinery Workers.

Copper Industry—Cleveland E. Dodge, vice-president, Phelps Dodge Corporation.

Silver, Lead and Zinc Industries—H. A. Guess, vice-president, American Smelting & Refining Co.; Frank M. Smith (alternate), smelter director, Bunker Hill Smelter.

Non-Metal Mineral Industries—Otho M. Graves, president, General Crushed Stone Co.

Mineral Policy and Government Committee—C. K. Leith, chairman, department of geology, University of Wisconsin.

Mining and Metallurgical Engineering—H. N. Eavenson, Eavenson, Alford & Hicks.

Liaison Representative for Mining Industry in General—Howard I. Young, president, American Zinc, Lead & Smelting Co., and president, American Mining Congress; Julian D. Conover (alternate), secretary, American Mining Congress.

Iron and Steel Industries—Thomas M. Girdler, chairman of board and president, Republic Steel Corporation.

Holmes Safety Awards Made

A bronze medal was awarded March 5 by the Joseph A. Holmes Safety Association to James Norton, Barnesboro, Pa., for heroic self-sacrifice in saving his fellow workers from possible injury when a runaway locomotive imperiled their lives. He died as a result of injuries sustained as a result of being thrown from the moving engine. Forty-one certificates of honor also were bestowed on coal companies for safety achievement, as follows:

Aetna Coal Co., Underwood, Ala.; Bell & Zoller Coal & Mining Co., Zeigler, Ill.; Bethlehem Mines Corporation, Ellsworth, Pa.; Black Diamond Coal Mining Co., Johns, Ala.; Blue Diamond Coal Co., Middlesboro, Ky.; Calumet Fuel Co., Somerset, Colo.; Consolidated Coal Co. of St. Louis, Mt. Olive, Ill.; DeBardeleben Coal Corporation, Coal Valley, Ala.; Diamond Coal Co., Providence, Ky.; Elkhorn Piney Coal Co., Wriston, W. Va.; Greensburg-Connellsville Coal & Coke Co., Greensburg, Pa.; Hanna Coal Co., St. Clairsville, Ohio; Heisley Coal Co., Nanty Glo, Pa.; Hotchkiss Coal Co., Monarch, Wyo.; Humphreys Coal & Coke Co., Greensburg, Pa.; Inland Steel Co., Wheelwright, Ky.; Jamison Coal Co., Greensburg, Pa.; Keystone Coal & Coke Co., Hunker, Pa.; Knox Consolidated Coal Corporation, Bicknell, Ind.; Liberty Fuel Co., Latuda, Utah; Lincoln Gas Coal Co., Washington, Pa.; National Mining Co., Morgan, Pa.; Nellis Coal Corporation, Nellis, W. Va.; North Western Improvement Co., Roslyn, Wash.; Penn Anthracite Mining Co., Scranton, Pa.; Pike-Floyd Coal Co., Betsy Lane, Ky.; Pittsburgh Coal Co., Pittsburgh, Pa.; Sheridan-Wyoming Coal Co., Monarch, Wyo.; South Union Coal Co., Greensburg, Pa.; Springfield Coal Corporation, Nanty Glo, Pa.; Stonega Coke & Coal Co., Stonega, Va.; Union Pacific Coal Co., Rock Springs, Wyo.; United States Fuel Co., Mohrland, Utah; Valier Coal Co., Valier, Ill.; Westmoreland Coal Co., Irwin, Pa.

Cincinnati Convention Program Covers Broad Range

Papers covering a wide range of production features will be presented at the Twelfth Annual Convention of Practical Coal-Operating Men, to be held in conjunction with the National Exposition of Coal-mining Equipment at the Music Hall, Cincinnati, Ohio, May 13-17, under the auspices of the Manufacturers' Section of the American Mining Congress. The program committee, of which Charles F. Hamilton, vice-president, Binkley Mining Co., Chicago, is chairman, announces that the topics selected for consideration include the following: effect of the 7-hour work-day on costs; human engineering; layer loading for uniform product; methods of blasting; mechanical loading under difficult conditions; power distribution to concentrated mining panels; multiple shifting; antifreezing agents for washed coal at tipple; high points in coal cleaning in 1934; modern truck hauling at strip mines; methods of preventing theft of coal in transit; handling of cars on conveyor loading; cooperation between operator and manufacturer in equipment design; cleaning coal at the face; car shifting behind mechanical loaders; modern main-line haulage; modern steam-generating plants; air conditioning underground; time clocks and recording injuries; modern mine ventilation; safety programs; screening and dedusting; recent developments in briquetting; treatment by oil or chemical to improve quality; mining system; dewatering mines; European methods as applicable to U. S. production; locomotive and cutting-machine maintenance; brakeless mine cars; outside refuse disposal.

The machinery exposition will include equipment for every phase of coal production from bearings to mechanical loaders. Already 97 manufacturers have contracted for more than 40,000 sq.ft. of floor space for exhibits. George R. Delamater, vice-prseident, W. S. Tyler Co., Cleveland, Ohio, is chairman of exhibits.

Cooperative Classes in Safety

Mine safety classes are being held on Tuesday evening of each week in Terre Haute, Ind., with the cooperation of the following companies: Snow Hill Coal Corporation, Dixie Bee Coal Corporation, Walter Bledsoe Coal Co., Standard Fuel Co., Fayette Realty & Development Co., Universal Coal Corporation, Davis & Mooney Coal Co., Linton-Summit Coal Co., Peabody Coal Co., Blackhawk Coal Corporation and Oak Hill Coal Corporation. The first meeting was held March 5, and an effort is being made to have mine workers from other companies in the Terre Haute and Clinton districts participate in future meetings.

Senate Subcommittee Indorses Guffey Bill; Many Features Amended

SENATOR GUFFEY'S bill providing for federal control of the bituminous coal industry (*Coal Age,* March 5, 1935, p. 132) was reported favorably with amendments on March 13 to the Senate Interstate Commerce Committee by Senator Neely, chairman of the subcommittee which held hearings on the measure. As revamped, the clause designating the industry as a public utility has been eliminated; the method of allocation of tonnage has been modified; production districts have been revised, and it has been provided that working hours established by two-thirds of the tonnage and a majority of the employees shall be binding on the entire industry. Senators Neely, Minton, Moore and Davis, who sat in at the hearings, were unanimous in recommending passage of the bill as revised. No action has been taken on the bill by the full committee.

In amending the measure, its application is definitely limited to mining by changing the expression "distribution of bituminous coal" to "its distribution by the producers thereof." The scope of the bill has been enlarged to include the protection of interstate commerce and the national public service of bituminous coal; elimination of "excessive facilities for the production of bituminous coal," which have led to wasteful methods of production and distribution; the assurance to mine workers of the right to organize, etc., as a prevention of "constant wage cutting and the establishment of disparate labor costs detrimental to fair competition"; prevention of obstructions to interstate commerce occasioned by industrial disputes "over unfair labor relations at the mines."

Membership on the National Bituminous Coal Commission has been increased from five to nine—five impartial members, two producer representatives and two for the employees. The basis for computation of the 25 per cent tax is changed to read "sales price or other market value at mine" and the 99 per cent rebate is to be deducted at the time of payment. Provision for and all references to a National Coal Producers' Board are eliminated, practically all the duties originally assigned to the board being now assigned to the commission. Districts and district boards are cut from 24 to 21 and, instead of five representatives of producers and one employee member, it is now specified that there shall be not less than three nor more than fifteen, and in any case only one is to be an employee member. More specific provisions for organization of marketing agencies are made, with arrangements for their representation on district boards.

Allocation Basis Changed

Tonnage allocation to each district is to be made by the commission, based on 1934 production, instead of the 1919-1934 average, plus 1934. The quota basis for mines is changed from the annual average since 1929 to the percentage which the two years' maximum output of any mine between 1925 and 1934 bears to the maximum two years' production of all mines in the district during the same period. Provision for new allocations every two years is eliminated. When a code member's mine shall become worked out, he shall be entitled to open a new one in the same field in order to retain his quota.

Minimum price determination, instead of being made in the first instance by the commission, is to be carried out by each district board, subject to commission approval. A new rule is that the minimum price shall be the average production cost of 90 per cent of the district tonnage, the 10 per cent highest cost production being eliminated. Under a new provision, the commission, on appeal from any district board, will allow lower than minimum price for 1¼-in. slack, if the lower price is necessary to move the slack, if such sale will not be discriminatory between producers or districts, and if the slack has not been produced by breaking or crushing. Beyond the provision that the commission may hear complaints that prices are excessive, and make proper orders to correct the abuse, no provision for establishing maximum prices now remains in the bill.

E. C. Mahan
Plays Rôle of Harmonizer

Appended to Sec. 5, relating to "organization of the code," is a provision empowering the commission to issue cease and desist orders against code violators. Under the same heading is a new section stating that orders of the commission or the Labor Board are subject to judicial review. Federal departments and agencies are required under Sec. 13 (a) to buy coal only from producers who have complied with the code, and subsection (b) provides that contracts by such departments with contractors shall bind the latter to buy coal only from such producers.

In acquiring properties for a bituminous reserve, the Secretary of the Interior is authorized to obtain by condemnation proceedings as well as by purchase not only bituminous coal lands but "coal mines, coal properties, coal lands, mining rights, leaseholds, royalties, and any interest in coal and lands containing bituminous coal deposits suitable for mining." The commission, in advising on the acquisition of coal properties, is instructed to take into account the effect upon (a) conservation, (b) employment of labor, (c) coal cost to the consumer, (d) promotion of fair competitive relations, and (e) elimination of overcapacity. Expenditures for this purpose in each district, a new provision states, shall bear a reasonable relation to taxes collected for the purpose. The tax rate per ton for raising funds to purchase such lands, as revised, is: 1935, 4c.; 1936, 7.3c.; 1937, 8.7c.; 1938, 6.9c.; 1939 and succeeding years until the coal-land purchase bonds are retired, 3.21c.

Tax Provisions Revised

As amended, the provisions for using the proceeds of the tax are as follows: From 1935 to 1938 they shall be devoted to (1) administrative cost of acquiring properties, (2) interest on bonds, (3) the miners' rehabilitation fund, an amount equal to 25 per cent of the face amount of the bonds being paid into the rehabilitation fund. In 1939 and thereafter the proceeds shall be allocated to the administrative cost of acquiring properties and to interest and sinking fund for the bonds.

In order to cut down the number of districts from 24 to 21 (see *Coal Age,* March, p. 134), the following changes are made:

District 1 — Includes former District 1 with Bradford and Mifflin counties added and parts of Armstrong, Fayette, Indiana and Westmoreland counties removed.
District 2—Combines former District 2 with parts of Armstrong, Fayette, Indiana and Westmoreland counties added, and West Virginia Panhandle removed.
District 3 — Includes former District 4 with parts of Nicholas County added.
District 4—Formerly was District 3.
District 5—West Virginia Panhandle.
District 6—North Carolina added to former District 6.
District 7—Combines former districts 5, 7 and 8, with North Carolina removed.
District 8—Takes in former District 10.
District 9—Changed from District 12.
District 10—Changed from District 11.
District 11—Changed from District 13.
District 12—Changed from District 9.
District 13—Takes in former District 15 with all counties in Oklahoma except Haskell, LeFlore and Sequoyah removed.
District 14—Combines districts 14 and 24 and all counties in Oklahoma except Haswell, LeFlore and Sequoyah.
District 15—Formerly was District 20.
District 16—Combines former Districts 21 and 22, with removal of Grant, Lincoln, McKinley, Rio Arriba, Sandoval, San Juan, San Miguel, Santa Fe and Socorro counties of New Mexico.
District 17—New Mexico counties enumerated in preceding paragraph.
District 18—All of Wyoming.
District 19—All of Utah.
District 20—Formerly was District 17.
District 21—Formerly was District 23.

Following testimony by Senator Guffey and Henry Warrum, general counsel, United Mine Workers, at the opening hearings before the Neely subcommittee, Feb. 19 (*Coal Age,* March, pp. 132, 133), C. F. Hosford, Jr., Coal Control Association of Western Pennsylvania, said the operators in that district were whole-heartedly in favor of stabilization "by means of the principles and policies" expressed in the bill. Though he believed fully in the principle of allocation and establishment of minimum prices, there was wide variance of opinion as to how some of these provisions should be carried out. He offered a redraft of the coal reserve title, in connection with which he pointed out that it would be effected by a tax on the industry itself instead of at the expense of the government. He favored a commission of seven and that anthracite production and distribution come under the act. He also would bar sale and transfer of quotas.

C. W. Watson, receiver, Elkhorn Coal

Corporation, approved the general features of the bill. He favored permanent control with czaristic powers vested in the coal commission of seven or nine members. He strongly objected to the marketing and allocation provisions, believing that "the majority of the industry can unite on the marketing provisions," but doubting that "there are any new districts that will agree on allocation."

John L. Steinbugler, president, William C. Atwater & Co., expressed approval in principle of the philosophy of the bill, though disagreeing with some of the details. He considered the restriction and proration of output the outstanding features, declaring that these would do directly what the code had attempted to do in an indirect way. He suggested that this legislation be made temporary—for perhaps 2½ years, but added: "If I had to decide between having this legislation and not having it, I would take my chance on permanent legislation."

NRA Officials Testify

N. W. Roberts, acting deputy administrator, NRA, who appeared at the request of Senator Neely, said a comparison of conditions prior to the enactment of NRA and the code with conditions under the code showed the need for federal supervision of the coal industry. He considered both price and production control necessary, and, though he said he had not had time to study the bill, he approved of it in substance.

Wayne P. Ellis, division administrator, NRA, who testified at the request of the subcommittee, said the bill "carries on what was attempted to be set up under the code, in addition to having the allocation scheme definitely set up, and providing for penalties." He strongly favored the quota plan, but thought that the bill should provide for more direct control of distribution. A number of other provisions, he said, needed clarification.

J. B. Brunot, vice-president, Irwin Gas Coal Co., indorsed the bill as a "very constructive piece of legislation." With some modifications, he said, the proposed act "can prevent the trend toward monopoly." The tax provision of 25 per cent on the sale price of coal, with the 99 per cent drawback for compliance with the code, even though withheld for one month, he thought would be a hardship for many producers. He also objected to the election of district boards on the basis of tonnage alone.

Representing the Alliance of Truck Mine Associations of Western Pennsylvania, A. K. Renwick favored the commission control proviso, the commission representing the public rather than operators or employees. Former Senator J. N. Camden, president, Kentucky River Coal Corporation, favored the bill because he thought it would make permanent the stabilizing effects brought about by NRA. However, he urged an amendment that would accord a holding company's tonnage in proration the same treatment as would be accorded to the same amount of tonnage owned outright by the operating company.

Joseph Pursglove, president, Pursglove Coal Mining Co., declared he did not think the coal industry could get along without the bill if bankruptcy of operators and starvation wages for labor were to be averted. Subject to amendments, E. H. Davis, chairman of the board, New York Coal Co., and representing the Ohio Coal Control Association, stated that he was in favor of the bill. William Emery, Jr., president, Cambridge Collieries Co., and vice-president, Ohio Coal Control Association, who testified later, offered as amendments a disinterested commission consisting of at least seven—possibly nine or eleven—members; a distinction between intentional and unintentional violations within the scope of penalties; that what he termed untried and experimental provisions be made temporary and subject to modification; and that competitive conditions—not cost only—be considered in fixing prices. Walter A. Jones, secretary Eastern Subdivision—Division I, expressed approval of the major portion of the bill.

Conceding that the coal industry "needed assistance," F. E. Berquist, Planning and Research Division, NRA, declined specifically to indorse the bill. Explaining that he had been requested to submit figures on tonnage sold at other than code prices, he said that in November, 1933, 60 per cent of the coal was sold under contract in Division I at about 31 per cent below the code scale. As contracts expired, the percentage fell, the eastern subdivision showing in April, 1934, 39 per cent; May, 29.8; June, 25. Western Pennsylvania showed a drop from 35 to 19 per cent in the same period; northern West Virginia, from 34 to 28; Southern Subdivision No. 1, from 28 to 22; Division II, Illinois, from 56 to 55 for deep mines, and 72 to 65 per cent for strip mines; Division III, from 63 to 45 per cent. By July the percentage for five subdivisions of Division I had fallen to 17. Division III showed in July 16.6 per cent; August, 5; September, 3.8; and October, 5.6 per cent. Later figures, he said, were not available.

Not Enough, Says Mrs. Boyle

Mrs. John Boyle, Jr., representing the Consumers' Council of Washington, D. C., favored the general purpose of the bill but declared it did not go far enough—outright nationalization might be better.

H. W. Showalter, president, Continental Coal Co., indorsed the commission feature as imperative for the security of operators, miners and coal consumers. As an amendment to the provision for fixing a minimum price based on average production cost, he suggested that that figure be raised probably as much as 10c. per ton, in order to provide for depreciation and depletion. Mines taken over by the government, he insisted, should not be acquired at the expense of the industry.

Philip Murray, vice-president, United Mine Workers, supported the bill, not only because it would help the miners but because "in the end it will be a good thing for the consumers." The ills of overdevelopment and too many men, he contended, could be cured only by federal regulation. The union, he said, was amenable to any minimum price arrangement offered in good faith. Van A. Bittner, president, District 17, UMW, also praised the bill highly, but admitted that, though strongly wedded to allocation, he thought no system should be used that would shift tonnage to the detriment of labor.

Charles O'Neill, president, Eastern Bituminous Coal Association, said that organization's board of directors had gone on record in favor of "the principles of price and production control," though the Clearfield Bituminous Coal Corporation (subsidary of the New York Central R.R.) is opposed to the bill. The commission and labor board should consist entirely of disinterested members. He objected to a bare majority fixing minimum wages and maximum hours. Mr. O'Neill recommended incorporating in the act the fair trade practices defined in the coal code, and that the Coal Commission be empowered to hear and determine complaints alleging their perpetration.

Indorsing the bill in principle, John G. Hoffstot, president, Lincoln Gas Coal Co., suggested its provisions should cover producer, wholesaler and retailer, each of whom should bear his share of the tax; that the proposed national and district boards be replaced with a deputy commissioner for each of the 21 or 24 districts. In arriving at quotas he favored production prior to 1929 as a basis.

Hawthorne Opens Attack

The first witness in opposition to the bill was H. R. Hawthorne, vice-president, Pocahontas Fuel Co., who spoke as representative of the Smokeless Coal Operators' Association. Conceding that conditions had improved under NRA, he said the betterment was due not only to the code but general improvement in business. He urged continuance under the code, contending that allocation, price fixing, labor relations and setting quotas for new or reopened mines were not interstate commerce.

Another witness for the smokeless operators, J. Walter Carter, president, Carter Coal Co., cited Geological Survey figures on coal resources to show that the need for conservation was doubtful, though he disclaimed wasteful mining methods. The shift in production caused by allocation, he said, would work serious harm to producers in the smokeless field. He was skeptical as to assurances that modifications in allocation would be made to prevent serious dislocations. He disapproved any form of permanent federal regulation, urging temporary continuance of the code rather than "premature and hasty legislation." Physical mergers, with concurrent provision for displaced employees, would bring lower costs and lower prices without reduction in wages.

Huston St. Clair, vice-president in charge of operations, Jewell Ridge Coal Corporation, indorsed in toto the testimony of Mr. Carter. He also said he considered allocation unworkable because of necessary shifts in tonnage due to demands for special-purpose coal, for which reason he fav-

Black 30-Hour Week Bill Favorably Reported

The Black 30-hour work-week bill was favorably reported to the Senate by the Senate Judiciary Committee on March 18. There was no indication, however, as to when action in the Senate would be taken. Senator Austin, Vermont, who regards the proposal as unconstitutional, said he would file a minority report. A similar measure was passed by the Senate at the last term of Congress, but failed of ultimate approval.

ored a temporary expedient, such as extension of NRA, rather than bureaucratic control. P. C. Thomas, vice-president, Koppers Coal & Transportation Co., voiced similar objections, with recommendations along the same lines as those of Mr. St. Clair.

R. H. Gross, chairman of the board, New River Co., and also representing smokeless operators, preferred temporary legislation extending NRA for two years. The code, he said, made it possible for the operators to pay good wages, to furnish coal to consumers at uniformly reasonable prices, provided more work for miners and some earnings have been made by those owning the properties and furnishing capital for the undertaking. He opposed government acquisition of coal properties.

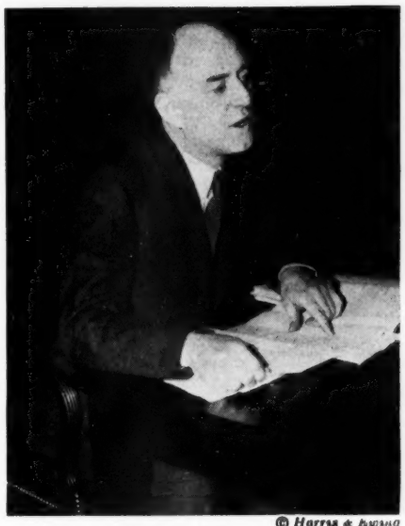
W. Gaston Caperton, president, Slab Fork Coal Co., and likewise a spokesman for the smokeless operators, advocated shelving the Guffey bill and giving NRA a further trial of two years. The code had not had time for a fair trial, he said, and, as it embodied all the worth-while features of the Guffey bill, there was no need for such legislation. Jonas Waffle, managing director, Coal Trade Association of Indiana, who testified later, was in substantial agreement with this view.

Another witness for the smokeless producers, William G. Caperton, vice-president, Slab Fork Coal Co., said he found no one in favor of the bill. Denying that bituminous production and distribution is affected with public interest, he pointed out that 27 boards, consisting of 192 members, were provided for in the Guffey bill. The set-up of the National Coal Producers' Board was inequitable, he contended, in that small producing districts were accorded inordinately large representation in comparison with larger producing districts. Under the provision against transferring quotas he saw the likelihood of serious loss by an owner of a single high-cost mine unable to produce and sell coal at the fixed price. Similar views were expressed by W. G. Crichton, chairman, Smokeless Code Authority.

Constitutionality of Bill Challenged

C. W. Dillon, of counsel for the Smokeless Coal Operators' Association, characterized the proposals declaring the production, distribution and use of bituminous coal to be affected with public interest requiring regulation of the industry as a public utility, providing for allocation of production, price fixing, regulation of hours and wages for labor, and imposing a 25 per cent sales tax with 99 per cent drawback to producers accepting the code as beyond the constitutional powers of Congress. "I am convinced," he said, "that no possible amendments embodying its essential provisions could make it a valid piece of legislation." M. F. Gallagher, attorney for the Indiana Coal Trade Bureau, and Maurice H. Winger, representing certain Southwestern operators, also opposed the measure on constitutional grounds.

Chester Leasure, U. S. Chamber of Commerce, filed a statement on behalf of Henry I. Harriman, president of the chamber, opposing all federal regulation of coal, contending that the Guffey bill in some respects goes beyond previous proposals for government control. Such regulation, lacking flexibility and the opportunity for progressive adjustment to economic conditions,



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H. R. Hawthorne
Leads Opposition to Bill

should give place to cooperation between industry and government. Speaking as official representative of the National Association of Manufacturers, of which he is secretary, Noel Sargent questioned the legality of an attempt to regulate production and maintained that, since coal was not "a necessary of life," it was impossible to justify indirect efforts at production control under the guise of control over transportation and rates. Expressing sympathy for the plight of the coal industry, John J. Hickey, counsel for the Manufacturers' Association of Connecticut, nevertheless, objected to federal regulation of a private enterprise such as coal.

Railroads Condemn Proposal

As representative of the Association of American Railroads, C. S. Duncan, economist, condemned the extension of regulation in the bill to captive mines, since, by increasing the cost of coal, it would raise railroad operating costs, besides dictating to a large extent at which mines the carriers may obtain coal. Impetus would be given to the inroads of substitute fuels, causing a further decline in tonnage and revenues to the roads. Besides increasing the cost of coal to consumers, the bill, he said, would enable the the bituminous industry, "under the cloak of an industry affected with public interest," to escape the anti-trust laws and "consolidate monopolistic powers."

Speaking for the Hazard Coal Operators' Association, E. C. Perkins voiced the opposition of small operators, which, he said, predominate in that field. He objected especially to inclusion of the Hazard field with any other code district, because of its limited shipping outlet. He urged continuance of NRA, but, failing that, would hold out for amendment of the Guffey bill to create a separate code district for the Hazard field. With a touch of grim humor, former Representative John Young Brown, counsel for the Hazard association, pictured the bill as a dead horse left on the little fellows' doorstep by the big boys from Pennsylvania—and the latter's large voting power made it difficult to do anything about it.

D. A. Thomas, president, Montevallo Coal Mining Co., speaking in behalf of the Alabama Mining Institute, pictured annihilation of the coal industry as well as serious crippling of pig-iron and steel production in his State if the bill were passed. The physical characteristics of the coal there have hampered mechanization, he said, and further taxing, which would raise the price, would cause more disastrous inroads by competing forms of energy, TVA in particular.

Appearing as spokesman for Division V, Bituminous Coal Code, Eugene McAuliffe, president, Union Pacific Coal Co., said the bill disregarded the interests of the consumer in favor of labor, except for safeguards in the interest of the producers. Taxing of captive output, which did not compete with commercial production, he considered unfair, besides which the cost of railroad coal would be greatly increased. The army of employees that would be required to assist the numerous boards probably would double the estimated expense of administering the law.

A brief submitted by the United States Steel Corporation pointed out the integrated relationship between its captive coal and steel production and alleged that the declared purposes of the bill clearly showed its inapplicability to captive mines. This viewpoint was concurred in by similar statements by the Bethlehem Steel Corporation, Jones & Laughlin Steel Corporation, Republic Steel Corporation, Youngstown Sheet & Tube Co., Crucible Steel Co., Weirton Steel Co. and Wheeling Steel Corporation. H. D. Williams, Pittsburgh Steel Co., which owns Monesson Coal & Coke Co., also opposed the bill as it affects captive mines.

Admitting that price control would be futile without allocation, James D. Francis, president, Island Creek Coal Co., asserted that the prorating method proposed in the bill is inequitable. Quotas should be based on a company's highest annual output during the last five years. Government purchase of "going" mines, rather than inactive operations, he said, would be more effective in curtailing overproduction. Expressing doubt as to the legality of the law, he said most of its purposes could be attained through the formation of voluntary organizations such as Appalachian Coals.

Williamson Field Protests

As spokesman for the Operators' Association of the Williamson Field, L. E. Woods, president, Crystal Block Coal & Coke Co., emphasized the disastrous effects which he said the marketing provisions of the bill would have in his field. The price-fixing plan, he feared, would put producers of low-grade coal out of business; the prorating scheme would be as bad. The districting arrangement suggested would split the field into different districts.

Stating that he appeared neither as an opponent nor proponent of the bill, Buford C. Tynes, counsel for holding companies in the high-volatile fields of southern West Virginia and eastern Kentucky, feared the effect of the act on existing contracts with lessees of coal lands. The provisions favorable to the miner were so bound up with features objectionable to producer, land owner and the public that he could not support any part of the bill.

Inroads by oil and gas in the Southwest, said Kenneth A. Spencer, president, Southwest Interstate Coal Operators' Association, had been so great with steadily in-

creasing costs that any further burden, such as the tax imposed by the Guffey bill, would imperil the coal industry in that field. Similar reasons were advanced for opposing the bill by Grant Stauffer, chairman, Division IV, Coal Code Authority. J. G. Puterbaugh, president, McAlester Fuel Co., warned against such a major operation as the Guffey bill before the patient had recovered from the first—NRA.

To simplify compliance with the requirements of the bill, Charles Selden, Jr., receiver, Blue Lick Mines, suggested that the Coal Commission be empowered to suspend car supply to an operation that did not comply. George W. Dowell, as representative of the Progressive Miners, submitted a brief against the bill as prejudicial to the interests of "independent" operators and their employees.

In presenting a brief opposing the measure, Dr. S. P. Burke, as spokesman for the Northern West Virginia Subdivisional Coal Association, said he firmly believed enactment of the bill would not achieve its objective; that it was unconstitutional, inequitable and unfair to the interests of consumers, to West Virginia operators and miners; and that it was unsound in principle and administratively unworkable. S. D. Brady, Jr., president, Osage Coal Co., indorsed this view and, further stressed the injury he would suffer under the proposed allocation plan in the bill. As his mine has been in operation less than five years, he stood to lose 32 per cent of his business under the plan, and he considered it impossible to amend the bill to protect everyone.

Allocation Under Attack

Concurring in previous objections to the marketing provisions of the bill, E. H. Suender, consulting engineer, Consolidation Coal Co., said the allocation feature would dislocate tonnage, force coal upon the consumer that he does not desire, and at a higher price. He denied that overdevelopment was as great as alleged, holding that the fair measure of normal capacity was the peak requirement in any month. He favored extension of NRA.

C. S. B. Ward, president, American Wholesale Coal Association, pointed out that the bill made no provision for the wholesaler, whose elimination would destroy any outlet for the small producer's output. Distribution, he asserted, is the real problem to be solved, and, since the bill fails to cover this feature adequately, it is faulty in its present form and would continue uncertainty.

The first rebuttal witness, E. C. Mahan, president, Southern Coal & Coke Co., appeared as the representative of the Southern Appalachian Coal Operators' Association, which, he declared, "generally speaking," favored some form of federal legislation. The Guffey bill could be made workable, he said, with some changes, such as increasing the commission to seven members and basing allotments on outputs since 1923, allocations to mines and districts to be on the same basis. The marketing provisions also should be more elastic, he advised, suggesting that a marketing agency be set up to so fix minimum and maximum prices on each size of coal at each mine as to permit a fair return on the investment and permit competition within the top and bottom figures. In fixing hours of labor, he suggested that 66⅔ per cent of the tonnage be necessary to an agreement. He urged that in the government's acquisition of surplus capacity, no undeveloped lands be acquired until at least 20 per cent of the production as of 1934 be eliminated, thus enabling the remaining mines to produce more coal without increasing the price.

Expressing sympathy with the program of conservation contained in the Guffey bill, Corwin Edwards, technical director, Consumers' Advisory Board, NRA, pointed out that authority in production and price control in the act was too largely vested in the industry for the good of the public.

Lewis Defends Measure

John L. Lewis, president, United Mine Workers, defended the bill with characteristic vigor. He praised its advocates and excoriated its opponents, revealing what he considered the background of their opposition. In attacking the captive-mine owners he said failure to control such production would cause expansion of such operations and consequent demoralization of commercial producers. He conceded that there was merit in the suggestion that the coal commission have more than five members and was agreeable to changes that would make allocation more equitable. He derided pleas to extend NRA, "for the reason that the Guffey bill embodies the code and all its voluntary and democratic methods of procedure."

In a brief statement, William Green, president, American Federation of Labor, urged passage of the measure on the plea that its administrative features are practical; its provision for regulation and control are sound and constructive, and that it represents the practical and constructive approach to solution of the economic problem in the bituminous industry.

In concluding the hearing, on March 5, Senator Neely, chairman of the subcommittee before whom the sessions were held, urged a spirit of cooperation among the advocates and opponents of the bill in order that constructive suggestions might be offered for making the bill workable. He warned them that unless some evidence of such spirit were shown the subcommittee would insert amendments it thought proper.

When the subcommittee reconvened on March 7 to bring about an agreement on proposals to amend the bill, the miners' union was represented by Messrs. Lewis, Murray, Bittner, Warrum and Earl E. Houck, attorney; and these operators were present: Messrs. O'Neill, Mahan, Hosford, Emery, C. C. Dickinson, T. G. Essington, Illinois; W. L. Robison, Ohio; and A. M. Liveright, eastern Pennsylvania. Some minor textual alterations were readily agreed to, and it was thought advisable to eliminate designation of coal production as a public utility, relying on its being "affected with public interest" as the basis for regulation. It also was agreed that the commission membership should be increased. There was considerable difference of opinion, however, as to whether the miners and operators should have representation, and in what proportion. Mr. Lewis held out for at least one miner and one operator member, but there was a lengthy colloquy among the operators on the question of equal representation for northern and southern producers. The upshot was an agreement on a commission of nine, of whom two would be from the operators' side, two for the miners and five at large.

Allocation proved to be the real stumbling-block, the chief difficulty revolving about what years to choose as a basis for quotas. Mr. Mahan conceded the justice of Mr. Robison's contention that the 1925-1934 period suggested was one in which his mines suffered serious losses in production because of labor troubles and adherence to NRA when many of his competitors were violating the code. Expressing regret at the evident impossibility of an agreement, Chairman Neely adjourned the meeting.

Personal Notes

A. B. ALDRIDGE, vice-president and general manager, Stith Coal Co., has been elected president of the Alabama Mining Institute, succeeding Darius A. Thomas, Resigned.

JOHN HESSLER, formerly connected with the Fort Harrison and Coal Bluff mining companies, Terre Haute, Ind., was appointed superintendent for the Crescent Coal Co., Evansville, Ind., March 1.

PAUL F. KEYSER, president of the Salt Lake City Chamber of Commerce and prominent Utah business man, was elected president of the Independent Coal & Coke Co., Salt Lake City, at the annual meeting of the company March 14. He succeeds C. W. Buckley, of Chicago.

SILAS LAMARR has been chosen night foreman of Siltix mine of the McKell Coal & Coke Co., Kilsyth, W. Va.

J. EUGENE MAY has been appointed fuel agent by the Baltimore & Ohio R.R. to succeed the late C. H. Dyson. Mr. May became identified with the fuel agent's office of the company in 1913, was made chief clerk in 1917, fuel supervisor in 1919 and assistant to the fuel agent in 1929.

C. M. STONE has been made foreman of Oswald mine of the McKell Coal & Coke Co., Oswald, W. Va.

Coming Meetings

Virginia Coal Operators' Association: annual meeting, April 20, Norton, Va.

American Wholesale Coal Association: annual meeting, April 26, Greenbrier Hotel, White Sulphur Springs, W. Va.

American Mining Congress: annual convention and exposition, May 13-17, Music Hall, Cincinnati, Ohio.

Mine Inspectors' Institute of America: 26th annual convention, June 3, 4 and 5, Beckley, W. Va.

Big Sandy-Elkhorn Coal Operators' Association: annual meeting, June 4, Ashland, Ky.

Illinois Coal Mining Institute: 17th annual boat trip on Str. "Cape Girardeau," leaving St. Louis, Mo., at 11 p.m., June 7, and returing to St. Louis June 9.

Short Course in Coal Utilization: College of Engineering, University of Illinois, Urbana, Ill., June 11-13.

American Society for Testing Materials: 38th annual meeting, June 24-28, Book-Cadillac Hotel, Detroit, Mich.

Mining Society of Nova Scotia: annual meeting, June 26 and 27, Pictou Lodge, Pictou, N. S., Canada.

Richberg Heads NIRB in New Set-up; Murray Added to Board

WASHINGTON, D. C., March 22.—Reorganization of NIRB with Donald H. Richberg as acting chairman, in place of S. Clay Williams, who is retiring, and the addition of Philip Murray, vice-president, United Mine Workers, and William P. Witherow, steel manufacturer and a director of the Pittsburgh Coal Co., to membership on the board on March 21 was the high spot in NRA developments during the past month. The announcement was made by President Roosevelt following a conference with William Green, A.F.L. president; John L. Lewis, president, United Mine Workers, and Sidney Hillman, NIRB member and president, Amalgamated Clothing Workers. Mr. Richberg indicated, however, that the new set-up was not permanent and was not intended to influence Congress on NRA legislation.

Mr. Green stated that labor would support legislation extending the life of NRA. When labor representatives appeared before the Senate Finance Committee, said he, they will ask that provision be made for equal representation of labor on administrative boards and code authorities. Reenactment of Sec. 7 (a) also will be sought. Despite these developments, indications are not lacking that new NRA legislation will have "tough sledding." This was foreshadowed by the grilling to which Mr. Richberg was subjected as the first witness before the Senate committee March 7, in connection with the administration's request for a two-year extension of NIRA. At that time Mr. Richberg presented a 17-point program of revision to strengthen the act and improve its administration. His suggestions were directed largely toward further defining and clarifying its provisions, in line with President Roosevelt's message to Congress on Feb. 20.

Appeals to the higher courts will be taken promptly on the adverse rulings of Judge Nields, of the federal district court at Wilmington, Del., and Judge Dawson, in federal court at Louisville, Ky. Judge Nields ruled in the Weirton Steel Co. case on Feb. 27 that Sec. 7 (a) is unconstitutional. Late the same day Judge Dawson reaffirmed his former decision that Congress is without power to regulate wages in the bituminous industry and that in that respect the law is unconstitutional (*Coal Age*, June, 1934, p. 254). The original decision, carried to the Court of Appeals, had been referred back and a temporary injunction granted Jan. 16.

Amendment 7, providing labor representation on divisional and subdivisional code authorities, was approved by NIRB on March 14. This action had been foreshadowed two months earlier when the plan was approved by the NBCIB and unofficially indorsed by Division Administrator Ellis (*Coal Age*, February, 1935, pp. 91, 93). Establishment of a statistical bureau by western Pennsylvania completed the set-up in Division I for carrying out the provisions of amendment 4. C. F. Hosford, Jr., who was appointed managing director of the new bureau, directed all producers to file copies of contracts by March 10 and copies of invoices, etc., by March 15.

A committee to establish rules, regulations and discounts to govern transactions between wholesalers and bituminous producers in the following subdivisions of Division I has been appointed by NIRB: Western Pennsylvania, Eastern, Northern West Virginia Panhandle, Northern West Virginia, Ohio, Southern subdivision No. 1 and Southern subdivision No. 2. The committeemen are Willard E. Hotchkiss, former chairman, NRA general code authority; Roger B. Shepard, resident director of the Industrial Advisory Board, and W. Jett Lauck, United Mine Workers economist.

The newly created National Coal Board of Arbitration (*Coal Age*, March, 1935, p. 137) swung into action last month with several decisions involving price structures

Philip Murray

and practices. A proposal by the Eastern subdivision of Division I automatically authorizing an operator to hold business by meeting the lower prices of a competitor seeking the tonnage was unanimously disapproved as destructive of the code price structure. Elimination of price differentials based upon use was upheld when the board dismissed the complaint of Southern subdivision No. 2 against the proposal of the Eastern subdivision to wipe out premiums on coal sold to byproduct ovens. This action, however, was taken without prejudice to the right of any subdivision to add a price differential where additional mining and preparation costs are involved and a better quality of coal is prepared for one utilization as compared with another. This decision, the board announced, was not to be construed as an approval of any general lowering of steam-coal prices.

Enforcement activities of the past month included the filing of a bill of complaint in the U. S. District Court at Cleveland, Ohio, against the Pittsburgh & Ohio Mining Co. and withdrawal of Blue Eagle rights from three operators. The court case charges violation of the price provisions of the code. Failure to sell at prices covering costs was cited in withdrawing Blue Eagle rights from Yukon Pocahontas Fuel Co., Yukon, W. Va. Clifford W. Nimmo, DuBois, Pa., and Charles G. Winters, Leeper, Pa. In addition, the Yukon company was charged with making secret rebates and terms of sale.

A memorandum clarifying the functions of the IAB was issued March 6 by NIRB which points out that the appeals board was constituted as "its agency to hear complaints of individuals respecting the inequitable application of codes." Upon impartial hearing, the appeals board "makes recommendation to NIRB as to proper disposition of the case. Such recommendations become official determinations when, and to the extent that, they are approved by NIRB."

Contending that "underhand chiseling" had been common during the last year, C. W. Handley, representing the American Wholesale Coal Association at an NRA hearing on March 14 on price differentials, testified that "wholesalers cannot exist on the 10c. allowed us in several areas. "He asserted that, while wholesalers are permitted under their code to "bargain for a differential," the code should be amended to establish a maximum figure "beyond which we cannot go." Twenty per cent of the total bituminous production is handled by wholesalers, said Mr. Handley, who "are of vital necessity to the smaller producing mines."

Kenneth U. Meguire Dies

Kenneth U. Meguire, 54, president of the Dawson Daylight Coal Co., Dawson Springs, Ky., died suddenly of a heart attack March 10 at his home in Louisville, Ky. Born in New Orleans, La., he was a graduate of the university of Louisville law school. In 1907, with Frank S. Snead, he formed the Snead & Meguire Coal Co., a selling agency, and about 1910 leased 13,000 acres of Harlan County coal land, becoming one of the first developers in that field. The Harlan Coal Mining Co., which he also organized, installed plants at Coxton and Kayu, which were sold in 1920 to the Koppers interests. The Dawson Daylight company, in western Kentucky, was developed later.

At various times Mr. Meguire was active in other companies, including the Letcher Coal Mining Co., Black Hawk Coal Co. and Paint Cliff Mines Co. He also was one of the organizers of the West Kentucky Coal Bureau; a member of the code authority of western Kentucky; director and one of the founders of the National Coal Credit Corporation; and member of a committee that drafted the Kentucky workmen's compensation laws.

Takes Over Menzies Cone

Exclusive rights for the manufacture, sale and use of the Menzies cone separator have been acquired by the Koppers-Rheolaveur Co., Pittsburgh, Pa. W. C. Menzies will cooperate with Koppers-Rheolaveur in the development and application of the equipment. The new owner has opened a branch office and laboratory in the Coal Exchange Building, Wilkes-Barre, Pa., for sales and service in the anthracite region. Stanley Glidden will be in charge of the new office.

Fate of TVA Now Up to Higher Courts; Gas-Line Project Elicits Protest

COAL PRODUCERS and proponents of the government's proposed far-flung hydro-electric developments are looking with anxious eyes toward the higher courts since the oral decision on Feb. 22 by Judge W. I. Grubb, U. S. District Court at Birmingham, Ala., declaring that the sale of electric energy by TVA in competition with private utilities would be illegal. A contract under which the Alabama Power Co. transferred transmission lines in northern Alabama to TVA, said the court, would put TVA in the utility business, and it had no legal right to conduct such business.

Pointing out that he was not passing on the constitutionality of the act creating TVA, the court held that "under the Tenth Amendment, or regardless of it, the United States has no right within the limits of a State to conduct any proprietary business, unless tied to some constitutional grant of power." He conceded that attached to a constitutional power, such as navigation, national defense or flood control, a surplus of energy could be sold, but he said it appeared from the evidence that TVA intended to produce power not as a surplus but to go into the utility business.

A temporary restraining order enjoining fourteen northern Alabama towns from accepting or expending PWA funds for construction of competing systems was made permanent by Judge Grubb in formal orders issued March 4. He ruled that as TVA and PWA are both branches of the U. S. Government, the utilizing of PWA funds for competing systems, in effect, would be assisting TVA in an illegal act.

Attorneys for TVA announced during the second week of March that they would take an appeal from Judge Grubb's decision to the federal Court of Appeals.

An interesting sidelight on the situation was provided when the city of Chattanooga, Tenn., voted—19,056 to 8,096—on March 12 in favor of an $8,000,000 bond issue for acquisition of a municipal power system to use TVA current. The Tennessee Electric Power Co., which now serves the city, says it does not intend to sell out to TVA or anyone else.

In an effort to "prevent harassment of TVA by the power trusts," a resolution requiring applicants for injunctions to post bond sufficient to cover all damages which might result from such legal actions was introduced in the U. S. Senate Feb. 28 by Senator Norris of Nebraska and in the House by Representative Rankin of Mississippi, co-sponsors of the origina' TVA bill. "I have no doubt about the Supreme Court reversing the opinion handed down in the lower court," said Mr. Rankin, "but we want to put a stop to this continual harassing of TVA on the part of the power trusts." Senator Norris also offered on March 4 an amendment to the TVA act which would give the Authority itself power to lend to municipalities funds necessary for setting up municipal power plants or in purchasing privately operated plants.

The final position of the coal industry with respect to a survey and test as between steam plants and hydro-electric plants in the Tennessee Valley was set forth in a letter from J. P. Williams, Jr., president, National Coal Association, to Dr. Arthur E. Morgan, chairman, TVA. Dated Feb. 22, the letter is as follows:

I beg to acknowledge receipt of your letter of Jan. 10, in reply to mine of Nov. 14, and, while it may seem to be futile to correspond further about the matter, I want to make myself clear with respect to the willingness of the bituminous coal industry to enter into an investigation, impartial in character, such as previously outlined by me, even though such a broad inquiry is unacceptable to you. I again express our desire to submit the actual facts to a disinterested agency.

The coal industry is determined to fight, to the best of its ability, the widespread building of hydro-electric plants, subsidized with the taxpayer's money, which will result in the destruction of the market for a large part of the production of bituminous coal, with consequent distress to mine workers, owners, railroads and all allied industries. Our contention has been from the start, and still is, that if there is a demand for additional electric power it can be generated much more economically in steam plants than in hydro-electric plants and that the development of large generating stations, such as contemplated by TVA, under the guise of flood control and national defense, is economically unsound and without any justification.

The coal industry is a large user of electric current and is not opposed to the lowering of electric rates, but does believe that this should be done under business-like conditions and not through the use of the taxpayer's money, and based on generating costs which will not stand up under an impartial investigation.

Characterizing the federal hydro-electric development program as the latest form of "pork barrel" in Congress, George J. Leahy, chairman of the National Job Saving and Investment Protection bureau for the Coal Industry, Chicago, launched a bitter denunciation late in February of bills for power projects presented in the present session.

"These various proposals for extension of the already oversized federal hydro-electric program," said Mr. Leahy, "will put out of business or seriously cripple many coal-mine operators who now supply fuel for steam-powered electric-light plants and eventually will throw out of employment an estimated 200,000 coal miners, railroad workers and others in dependent situations. The expenditure of staggering sums of money necessary to replace coal by water power in the generation of electricity must be realized eventually in the form of taxes. It certainly seems a short-sighted policy that provides for using a portion of the tax money paid by the coal industry to promote hydro-electrics which will in turn destroy the very source of the taxes so necessary to the operation of our government. It is not enough, therefore, for these hydro-electric projects to be self-supporting; they would need to make up in revenue for the amount of the taxes that would be lost to the government through the destruction of coal companies, private power companies and railroads whose existence depends upon coal traffic, and provides jobs for men these hydro plants will throw out of work."

Protests continue to pile up against the proposed natural-gas line from Texas to St. Louis and Detroit, to be financed by $50,000,000 of PWA funds. In a letter to Harold L. Ickes, Secretary of the Interior, Mr. Leahy asked permission on Feb. 27 to appear before Secretary Ickes and "indicate the extent of unemployment which this proposed line would cause, before funds are allotted to it." Natural gas on a strictly competitive basis, financed and operated by private capital, said Mr. Leahy, "is the coal industry's most severe form of competition, but for the government to finance and otherwise go into the natural-gas business, using taxes, as it always does, to meet any necessary charges—that is the last straw."

The Coal Exchange of St. Louis asserted that such a gas line would permanently displace approximately 3,000 men employed in the coal mines. Natural gas, declared the protest of the Southern Illinois Reciprocal Trade Association to Secretary Ickes, " has already replaced 5,000,000 tons of coal annually in Illinois coal-market territory, and is threatening replacement of 5,000,000 additional tons, and the unemployment situation in the Illinois coal-producing counties is appalling."

A protest against the proposed pipe line was issued by the Illinois Mining Institute on Feb. 28. In the form of a resolution stressing the loss of coal tonnage caused by existing pipe lines, with consequent unemployment, the petition points out the menace of the project by further inroads on the coal industry of Illinois as well as to the railroads.

Obituary

GEORGE S. PATTERSON, president, Sycamore Coal Co., operating at Cinderella, W. Va., died suddenly Feb. 28 of pneumonia. A graduate of Lehigh University, Mr. Patterson went to West Virginia from Pennsylvania and, with his brother, organized the Longbottom Coal Co., which was later sold to the Pocahontas Fuel Co. He also was extensively interested in other southern West Virginia coal developments.

PHILIP P. WOODS, 64, president, Pennsylvania Smithing Coal Co., died March 1 at his home in Brooklyn, N. Y. He had been identified with the marine transportation business until shortly after the World War, when he organized the coal company, which has a mine in Somerset County, Pennsylvania.

RALPH H. CLORE, general sales manager, Medart Co., St. Louis, Mo., died March 6.

KIRTLAND M. SMITH, 85, president, Alden Coal Co., Alden, Pa., died March 16 after a lingering illness. Practically his entire business life has been devoted to the anthracite industry.

BENJAMIN F. SHERROD, 52 secretary-treasurer of the Little Cahaba and Blocton Cahaba coal companies, operating in Bibb County, Alabama, died March 4 after a brief illness. He had been an officer of the two companies since 1906.

GEORGE M. JONES, 73 bituminous coal operator and former banker, died at Toledo, Ohio, March 13, after a long illness. Moving from Jackson, Ohio, to Toledo in 1898, he became interested in coal operations in Perry and Jackson counties and eventually became owner or part owner of 22 mines. Among sixteen the companies he controlled at the time of his death were the Ohio Collieries Co., George M. Jones Co., Cambria Collieries Co. and Monroe Coal Co.

Mechanization Problems Again in Limelight At Rocky Mountain Institute Meeting

WITH MECHANIZATION again in the limelight, developments in the Far West were brought to the fore at the 33d regular meeting of the Rocky Mountain Coal Mining Institute, Denver, Colo., March 18-20. While the keen interest in mechanical loading was reflected in the attention accorded that subject at the sessions of the institute, safety, including timbering, protective clothing, underground illumination and the relation of mechanization to accidents, received its full share of attention. Other mining activities, such as ventilation, use of storage-battery locomotives and face preparation, also had a place on the program.

Time studies are a necessity in mechanical loading because of the heavy investment in equipment required for complete conversion to a mechanical basis, declared C. E. Swann, chief engineer, and J. L. Libby, engineering department, Union Pacific Coal Co., in a paper read by the latter. Adaptability of the machine to the conditions it will encounter and the rate of obsolescence are factors which must be considered in selection. As soon as mechanical loading passes out of the experimental stage at a mine, the need for accurate information on just what is taking place is quickly manifested. Time studies furnish the means of obtaining this information, and, to be of value, must reflect average working conditions and must be supplemented by accurate cost accounting. Best results are obtained by taking records for the same machine over several shifts. Studying a different machine each day may result in erroneous conclusions arising out of variations in the condition of the loader, car supply, cutting and blasting conditions, roof and other factors.

Must Fit Plan to Machine

Where machines are installed, the mining plan must be fitted to the type of loader employed if the maximum average production is to be secured under working conditions satisfactory from the standpoint of safety and the effort required from the men. In planning underground operations, study, paradoxically, should start with an analysis of surface screening and loading facilities and then take up transportation (including rolling stock and track). Haulage is the bottle neck, and upon its proper coordination with respect to underground and surface activities depends the practicable daily output which may be expected.

Once the limitations of transportation have been determined, it is up to the loading equipment to produce the required tonnage at a fairly even rate. This requires accurate knowledge of the average daily performance which may be expected from a machine, which in turn determines the number of machines to be installed to avoid over- or under-mechanization. In determining the average daily tonnage for a given number of machines, the studies also should be extended to cover the number of men constituting the most economical crew for both single- and double-shift operation. When double-shifting is practiced, the crew must perform all the work necessary to keep the place in condition, prepare and load the coal, and install, move or extend the equipment. Coordination between crews becomes an essential item.

Time studies with mobile loaders show that car size and supply are the major factors in performance. As changing time is practically the same, increasing capacity reduces changing time—a considerable item unless trips can be run under the loading head as with mobile loaders. Moving from place to place is another major source of non-productive time with mobile loaders.

Shaker-Conveyor Time Studies

With shaker conveyors in entries and rooms in pitching seams, extensive time studies have shown that loading time is about 36 per cent of the shift, and that cutting, drilling and blasting require an approximately equal proportion of time. Time studies will reveal losses arising from the necessity for repairs, waiting on materials and other details involved in operation, and thereby will indicate the remedy. Where natural conditions are good, the scraper loader has a big advantage over the shaker conveyor in tons loaded per shift. But with heavier cover, and with a progressive swing away from ideal conditions, the question of shakers on long faces comes more into the picture. While varying conditions make determination of the best length of face for maximum scraper output difficult, the ideal is a face which will yield sufficient coal for steady work and yet can be cleaned up in a shift in preparation for cutting, drilling and blasting.

Shaker-conveyor loading on a long face can be stopped and started any time and otherwise is a continuous operation. Adverse conditions resulting from bad top, dirty coal and other drawbacks are more easily overcome. "Recent experiments with loading out long faces with conveyors have given encouraging results," and presage extensive use in Union Pacific mines when the men become accustomed to the work. "Time studies extending over a 20-day period on one machine show the loading time to average approximately 60 per cent of the working shift, with an increase in tons loaded per man-shift."

"A possible solution to the many added problems concerning labor, coal codes and a constantly diminishing market has been found through the use of Cardox when applied to mechanical loading," declared R. R. Kirkpatrick, superintendent, Standardville (Utah) mine of the Standard Coal Co. Mining conditions at Standardville include a gassy seam under 1,500 to 2,000 ft. of cover with fairly bad roof conditions. Required production varies from 50,000 tons a month in the winter to 5,000 tons in summer, and the cost of keeping the mine in shape to meet these fluctuating demands under the old spread-out hand-loading system was prohibitive. Rooms driven in the winter caved in the summer.

A retreating system under which small areas would be opened up to yield a maximum tonnage with mechanical loaders on single or multiple shifts offered a possible solution to the problem. Consequently, several entries were driven to the boundary and five rooms were turned at the inside end of one for a trial. A track-mounted Goodman loader was purchased and plans for the loader district were carefully prepared. All track, timbering, pipe and power lines are standardized.

The operating cycle is based on having one room ahead of the loader full of coal. Back of the loader is the mining machine, followed in the two succeeding rooms by the drill crew and the shot-firer. Tracks are connected through each crosscut to prevent interference between the various units, and the extra room of coal is kept to provide sufficient flexibility to take care of unexpected delays. The loader is serviced by two gathering locomotives handling eight-car trips between the loader and the parting 2,000 ft. away. Locomotives alternate in trips to the parting. Unit crews consist of twenty men per shift, including a foreman and a mechanic who services the equipment and extends power and pipe lines. Work is continuous over succeeding shifts, one crew taking up where the other leaves off.

Shooting on Shift Speeds Work

Under this system, each face is loaded out once or twice a shift, and advance and retreat are quite rapid. "Obviously, with any blasting agent not approved for use while men are on shift, the scheme outlined would be fairly complicated. Either a very large territory would have to be opened up or only one shift employed. Cardox in this instance serves a dual purpose. It permits a small district to be intensively mined and produces a better grade of coal" and more large sizes. A preliminary test showed an increase of 11 per cent in the yield of 3-in. lump with Cardox shooting.

Shell consumption has grown from a few hundred to over 12,000 a month in Utah, said Mr. Kirkpatrick. Few companies use Cardox exclusively, however, as the seasonal demand for small sizes makes this inadvisable. Yield per shell varies from 3 to 8 tons in Utah, and the cost varies accordingly. Generally, the mine with a low yield per shell obtains a larger percentage of lump to compensate for the increased cost of shooting. "If you can make one loader produce as much coal in 21 hours as three loaders working seven hours each, you have at least saved the price of two loaders and the expense of opening up three times the territory underground."

P. H. Burnell, superintendent, Owl Creek Coal Co., followed up his story of last year on conveyor mining at Gebo, Wyo. (*Coal Age*, April, 1934, p. 125), with an account of developments since his earlier presentation of the subject. The conveyor system is in operation on a 22-deg. pitch in a 7- to 9-ft. seam generating explosive gas and subject to spontaneous combustion. Pro-

duction under the new system has been greatly increased over the old system of hand loading, which could not possibly approach equal labor returns.

Crews consist of three men at the face, two of whom do the cutting, drilling and shooting while the other is getting the material together, and a motorman and nipper at the loading station. One foreman supervises five loading machines and cutting crews. Faces move 25 to 30 ft. per day, requiring more intensive supervision. Rapid advance also is a safety measure, as systematic timbering is essential, and no miner is required to enter a place where the coal has been shot the day before, with the result that the top may have become loose.

Fifteen improved types of conveyors with positive-type loading heads are in service. The exact control possible with these loading heads, said Mr. Burnell, has made it possible to operate two years without breaking a pan due to striking the face of the coal. A special link motion developed in southern Wyoming is employed to drive two conveyor lines at right angles, and it saves the installation of an extra drive and replaces the swivels formerly employed.

"The coal industry must be much more alert than it has been in the past" in using every possible weapon "to fight the economic changes that are threatening to destroy its prosperity," declared Benedict Shubart, Shubart & Schloss, Denver, Colo. While conditions differ from mine to mine, there always is some opportunity for reducing cost and it behooves the operator to look for such loopholes if he is to meet the competition of today. Shooting, including the use of snubbing pans, center cutting to remove dirt streaks, timbering, power supply, and transportation are among the logical points of attack. There is no universal loader; mining conditions and market requirements determine the particular type to be used in each individual case.

Caterpillars Conquer Grades

Caterpillar-type loaders have operated on grades impossible or dangerous for other types; the slope-driving work at the Hanna (Wyo.) mine of the Union Pacific Coal Co. is an outstanding example. This operation has employed a 5BU Joy loader for a number of years for driving slopes down a pitch varying from 9 to 18 deg. Supplementary equipment includes a slope hoist and the necessary pit cars. With a width of 12 ft. and a height of 9 ft., the slope face yields 38 tons per cut. The loader is let down on the hoist rope also used to service the slope and handle the cars, and after once arriving at the face handles itself, although it has been found that it is more convenient to use the hoist when moving sidewise. Empties are let down in trips by the hoist, and as fast as a car is loaded the trip is pulled up the nearest level entry, where the load is detached. Five men comprise a crew, which does all the necessary work and averages from 65 to 75 tons per seven-hour shift. Since Sept. 12, 1931, 3,300 ft. has been driven on grades of 9 to 12 deg. at No. 6 mine and 5,800 ft. at 14 to 18 deg. at No. 4 mine.

Conveyor Driving Entry at Owl Creek Coal Co.

Rate of pay, while important, is not nearly as important as the method of pay, Mr. Shubart declared. Tonnage rates or bonus systems in many cases tend to cause men to work only just enough to earn a slight premium, or where management, through careful organization of the loading plan, has been able to increase the tonnage an unjust proportion of the benefits go to the men, with the result that it is difficult to reduce cost. A tonnage rate also tends to shift supervision of the unit to the crew from the shoulders of company officials who can view the operation as a whole from the cost-reduction standpoint.

While the product must be clean, mechanical loading should not be dismissed because of some dirt in the coal. If 20 to 30c. per ton can be saved with an increase of 5c. in preparation cost, mechanical loading manifestly is a bargain. Turning to another phase of mining, Mr. Shubart remarked that a number of slope conveyors had been installed at operations handicapped by small cars in mechanical loading. Up to 200 ft. depth, such installations generally are comparatively inexpensive and economical to operate, and save a part of the expense that would be involved in putting in a new shaft and headframe.

Lower Costs the Real Answer

Profit margins no more depend upon higher-priced coal than upon lower production costs, declared Walter M. Dake, consulting engineer in charge of sales, Joy Mfg. Co., in a paper read in his absence by Charles Schloss, of Shubart & Schloss. Prices may reach higher levels, automatically increasing the use of substitute fuels while maintaining a profit margin on a decreasing production, but lower production costs will both maintain profit margins and allow active competition with substitute fuels. Increased production per man employed is the age-old answer to the problems of the industry. With labor still constituting two-thirds of production cost and increased wage rates and shorter hours an actual fact, what more practical solution can be found than the addition of power mechanisms to highly trained human endeavor for greatly increased outputs per working hour?

Immense tonnage outputs per machine shift with large crews are not as economical as they may sound, declared Mr. Dake, as outputs as low as 100 tons per machine shift with four-man crews are being shown to equal total cost per ton in the spectacular installations. Coal operators are becoming more aware of the fact that more efficient devices of all types must be figured in their relation to the particular operation as a whole, and that progress must be measured in terms of net f.o.b. mine-cost savings. These in turn are made up of two important factors: increased production per total employee and ultimate profit margin in the product.

Have Met Earlier Claims

Referring to a theoretical projection made twelve years ago by the author and R. A. Walter, Mr. Dake pointed out that there are now several installations where mobile loading machines are advancing faces at an even more rapid rate than was contemplated in 1923, discharging their output onto multiple conveyors, which in turn discharge onto heading conveyors and then onto mother conveyors having production capacity of 200 tons per hour. The only remaining step to fulfill the prediction of twelve years ago is the completion of continuous conveyor haulage to the surface.

Systematic timbering at the Superior mines of the Union Pacific Coal Co. had its origin in the introduction of mechanical loading, declared George Brown, superintendent, in a paper read by V. O. Murray, safety engineer. A particularly tender roof in the mine where the machines were first installed demanded that every element of chance be eliminated as far as possible; this made it necessary to adopt a fixed standard of timbering that would give maximum protection and yet permit the machines to operate most advantageously under the conditions usually encountered. The system was so well suited to the new method of loading and the natural conditions prevailing that little difficulty was encountered in installing it. The same cannot be said of mines where the roof condition is alternately good and bad.

The natural tendency of the miner is to neglect timbering where the roof is good and likewise it is not unnatural for the foreman to condone such lapses if they can secure an immediate additional ton of coal. In either case, however, such neglect ultimately leads to

disaster. Orderliness and the support of the supervisory force are essential elements in a system, and in the case of timbering such orderliness unconsciously leads to orderliness in other activities.

Accident prevention should head the list of the benefits of systematic timbering, and while it is impossible to say definitely just how much this contributes, the Superior mines produced 700,000 tons in 1934 with 480 men and only seven lost-time injuries. Once a system is well established and all workmen are familiar with it, many of the troubles that bedevil a foreman are overcome. No system, however, should prevent the installation of additional timbering where required and every workman should know that it can be placed without formal notification. Provision for a good manway to the face is necessary with systematic timbering, both from the safety standpoint and the transportation of material, particularly, as is the case at Superior, where track is not laid in the rooms.

Systematic Timbering Gains

The ease with which new men become familiar with a timbering system is another advantage which allows such men to become productive workers immediately and also, when started on timbering, inculcates in their minds the idea of constantly watching roof condition. Systematic timbering is particularly advantageous at mines where the roof, while good at first, tends to slough or break after several days' exposure, as it insures that the element of protection will not be neglected.

Experience at the Superior mines shows that while both pillar and timber recovery are largely dependent upon proper supervision, both activities are materially facilitated where advance work was supplemented by a systematic timbering plan. Open places are adequately protected, and a minimum of fallen material facilitates the retreating operation and the recovery of material.

For maximum efficiency in systematic timbering, ready-cut timber, caps and wedges of suitable size are particularly advantageous, Mr. Brown pointed out. Cap pieces at Superior are sawed in dimensions of 4x6x30 in.; wedges, 2½x6x 16 in. Various lengths of props are stocked to meet all variations in seam thickenesses, which range from 4½ to 8 ft. in the three operating mines.

The coal industry has been under fire for years—and deservedly so—because of the excessive number of accidents that have occurred, asserted D. Harrington, chief engineer, safety division, U. S. Bureau of Mines, for the improvement in the last three years has proved that there were too many accidents in the past. Mechanical loading in earlier years was responsible for many fatalities. A large proportion of the fatalities from explosions occurred in explosions of an electrical origin. Last year, the proportion was low, but, said Mr. Harrington, most people will grant that the good record of late years reflected a large element of good luck. For this reason, continued watchfulness is necessary to prevent a recurrence of the disasters of the past, and every operator must realize that while every piece of machinery going into a mine will eliminate some hazards, it will introduce others. But the favorable records made by many demonstrate that safety and mechanical loading are not necessarily inconsistent.

Systematic timbering strikes at the root of accidents from falls of roof and coal, and the sooner it is adopted the sooner such accidents will be eliminated. Probably the greatest hazard exists in mines where the roof ordinarily is considered good, Mr. Harrington contended, because of the tendency toward relaxation of protective measures. Scores of deaths and injuries are being prevented by protective clothing. Defective eyesight is another factor in accidents too often neglected. New-type electric cap lamps help out, and their advantages should not be overlooked.

While coal dust still is placed in the harmless class as a cause of dust diseases, this condition, if experience in the hematite mining region is any criterion, may be subject to a sharp revision in coming years. Immediate steps which can be taken to forestall future trouble include plenty of water on the cutter bar, the face and on the coal after it is shot down, and elimination of blasting on the shift.

Coal mining has reached the stage where it is no longer possible for animals to perform haulage work, observed A. C. Watts, general superintendent, Utah Fuel Co., Castle Gate, Utah. In making a choice between trolley or cable locomotives and storage-battery locomotives, "we must again face two conditions—economic and natural. The first—economic—left little choice because in Utah we purchase power and have a demand charge in the shape of a five-minute peak." Natural conditions, however, largely determined the adoption of storage-battery locomotives at Castle Gate. Gas and extremely explosive coal dust are present and the aim of the company was to have all electrical equipment working at or near the coal face of the permissible type. Three Baldwin-Westinghouse locomotives with Exide "Ironclad" batteries purchased for special service in another mine were moved to Castle Gate, and their satisfactory operation under very severe conditions resulted in the purchase of additional larger machines of the same type.

Storage-Battery Haulage

Performance, said Mr. Watts, has been entirely satisfactory despite the fact the work performed is at times much more than was expected of them. As a result of the rolly condition of the floor, adverse grades up to 10 per cent or more sometimes are encountered, even though entries and rooms are laid for grades of 1 and 4 per cent, respectively, in favor of the loads. Average haul is 600 ft. Car weight ranges from 4,300 to 4,500 lb. and the average loading is 4.1 tons. Cars are equipped with roller-bearing wheels. Track construction is based on the use of 40-lb. rail on 6x6x6-in. ties spaced 18 to 20 in. apart. Track gage is 40 in. The locomotives average 230 to 275 tons in seven hours.

Charging stations are built of concrete blocks with a concrete roof, and are located in crosscuts off intake airways. Each station is equipped with "Red Comet" extinguishers fused with automatic breakers set at 180 deg. F., which release about 600 cu.ft. of carbon-tetrachloride gas each.

The three locomotives originally installed at Castle Gate have a drawbar pull of 2,000 lb., said L. E. Brown, Westinghouse Electric & Manufacturing Co.; six units installed later have a drawbar pull of 3,000 lb. Charging is done on the off-peak period with 20-kw. motor-generator sets with sufficient capacity to charge two batteries at one time.

Bringing his description of 1924-1933 safety progress at the Dawson operations of the Phelps Dodge Corporation (*Coal Age*, April, 1934, p. 123) down to date, G. C. Davis, general manager, reported a recession last year. Why this should be is not definitely known, as there was no relaxation in the safety drive, but Mr. Davis offered as a possible reason the increase in unrest in late years. Twelve lost-time injuries, including one fatality, occurred. Only one was classed as unavoidable; the remainder resulted from acts of the injured men, fellow employees and supervisors. Head, eye and foot injuries continued at a low rate, partly reflecting the compulsory use of protective hats, shoes and goggles—a practice adopted several years ago.

While safe underground lighting systems using wired lights have been tried out to some extent abroad, first cost and maintenance make them impractical or uneconomical for this country except in places

Western Who's Who

Gilbert C. Davis, general manager, Stag Canon branch, Phelps Dodge Corporation, Dawson, N. M., was elected president of the Rocky Mountain Coal Mining Institute at the annual meeting in Denver last month. He succeeds H. H. Bubb, assistant manager, American Smelting & Refining Co., Cokedale, Colo. H. C. Marchant, president, Pinnacle-Kemmerer Fuel Co., Denver, was re-elected secretary-treasurer.

David Allan, president, Crown Fuel Co., Boulder, Colo.; J. L. Libby, engineer, Union Pacific Coal Co., Rock Springs, Wyo.; L. E. Brown, Westinghouse Electric & Manufacturing Co., Salt Lake City, Utah; and J. R. Barber, assistant chief engineer, St. Louis, Rocky Mountain & Pacific Co., Raton, N. M., were elected State vice-presidents.

The personnel of the new executive board (two representatives from each State) is: Warren Bracewell, State mine inspector, Albuquerque, N. M.; Val Cassidy, chief electrician, Owl Creek Coal Co., Gebo, Wyo.; George B. Dick, president, Gordon Coal Co., Walsenburg, Colo.; Otto Herres, assistant general manager, United States Fuel Co., Salt Lake City, Utah; R. R. Kirkpatrick, superintendent, Standard Coal Co., Standardville, Utah; John Maklovich, superintendent, Gunn Quealy Coal Co., Quealy, Wyo.; Horace Moses, general manager, Gallup American Coal Co., Gamerco, N. M.; and W. G. Plested, general manager, Bear Canon Coal Co., Trinidad, Colo.

where the lights are permanent and there is no accumulation of gas, said Graham Bright, engineer, Mine Safety Appliances Co. Because of the rapid movement of the face, lighting the working place with wired lights generally has been found impractical, with the result that the small portable lamp is supreme in this field. American miners prefer to use cap-type lamps to the hand lamp used overseas because the cap lamp leaves both hands free and the light always is close to the work. As a result of the improved illumination efficiency—an average of 7.32 foot candles at 3 ft. from the face, as compared with 0.245 foot candle for earlier types and 2.77 foot candles for the best carbide lamps—installation of electric cap lamps underground, Mr. Bright contended, need no longer be justified on the score of safety only, as the more powerful and steadier light, plus elimination of adjustments during the shift, results in increased efficiency.

Goggles Eliminate Accidents

Compulsory use of goggles has eliminated all eye injuries at the mines of the Union Pacific Coal Co. since April 24, 1933, when the eye-protection program was completed, said V. O. Murray, safety engineer. Between 1925 and the date when eye protection became effective, compensation costs ran up to a maximum of $6,211 in a single year. In addition to the general principle of safety, adoption of goggles was motivated by increasing depth of workings, causing coal to fly off the face, and the installation of additional machinery in the increasing mechanization of mining operations, resulting in a greater eye hazard from repair work. Super armor-plate glass type goggles without side screens were prescribed for all employees except those in machine-shop repair work and tipples, in which cases goggles are equipped with side screens. Goggles with protective colored lenses and face masks are standard for welders. Average cost of fitting goggles, including examination and corrective lenses, where needed, was $3.21 per employee—a small sum when one injury can amount to several thousand dollars.

Ventilation performance is determined by the condition of the underground workings as well as the ventilating equipment, and both must be conducive to maximum efficiency if best results are to be obtained, asserted A. E. Condon, ventilation engineer, Jeffrey Manufacturing Co. Underground conditions are determined by the volume that the mine airways will pass at a given pressure, and good practice recommends that this pressure should not exceed 3 or 4 in. The lower the required pressure, however, the lower the power cost to supply the required ventilation will be.

Condition of stoppings apparently is seldom taken into consideration in calculating the volume of air that will be required by a mine, and "it has been my experience that the majority of mines are obtaining approximately 30 to 40 per cent of the air that the fan is handling at the face. However, during the past three or four years this bad condition is becoming recognized and steps are being taken to remedy it. Just recently I have made a couple of surveys and find that the effective air at the face has reached about 70 per cent of that handled by the fan."

Trying to save power at the fan itself is receiving increasing consideration. The first step in making power savings should be an investigation into the condition of mine airways, as the greater proportion of the possible savings can be by changing doors and introducing as many splits as possible. After inside efficiency has been raised to the highest possible level it is time to investigate the fan installation itself.

Conditions under which power savings may be possible through changes in fans or new installations, said Mr. Condon, fall into four groups: (1) fan too large for mine characteristics and therefore working under its normal capacity, with correspondingly low efficiency; (2) fan working beyond its normal capacity, also resulting in low mechanical efficiency; (3) installations employing old-type inefficient wooden-housed fans which become soaked with grease and present a fire hazard; and (4) installations employing old-style direct-propulsion, or disk-type, fans, used singly or in series.

Where fan size is too large, which seems to be the case in the majority of inefficient installations, practically the only solution is replacement with a smaller fan. Not all power wasted can be blamed on the fan, however, as the large motors quite often used operate at low power-factor and efficiency, and savings, frequently running up to 15 or 20 per cent, can be made by installing a smaller type. Approximately 75 per cent of the fans being installed at the present time replace existing units working under normal capacity. This is not a fault of the old fan, but generally is due to the fact that conditions have changed to the point where the old unit is not suitable.

Fans operating beyond normal capacity are exceptional in comparison with the former class. This condition may occur when the mine has grown to such an extent that the volume is so diminished by resistance that cleaning and enlarging airways will not solve the problem. The only recourse under these conditions is the sinking of an airshaft at the back of the property, which will cut mine resistance about one-fourth. When this is done the fan will be working beyond its capacity, and it is then time to consider installing a larger unit.

There are still too many fan installations subject to the fire hazard; these installations should be replaced with fireproof steel or masonry construction, said Mr. Condon. Disk-type fans in the fourth classification are more common in drift operations, most of them ventilated at pressures not over 1 or 2 in. Old-type disk fans were considered good when operating at an efficiency of 30 to 35 per cent. Fans of the Aerovane type give almost equal efficiency and are considerably less costly to install than large, bulky centrifugal units, although where mines are very gaseous and require high ventilating pressures the centrifugal fan will give the same results at a much lower speed.

Permissible Plate Issued

One addition to the list of permissible equipment was made by the U. S. Bureau of Mines in February. The approval (No. 279) was issued to the Mine Safety Appliances Co. on Feb. 14 and covers the Type 85 rock-dusting machine with 3-hp. motor, 80 volts, d.c.

Utah Renews Recovery Act

A new State recovery act, to be in effect for two years, was passed by the Utah Legislature before adjournment on March 8. The new law, which takes effect July 1, when the present one expires, has been tightened to make enforcement more effective.

Another enactment exempts gas made from coal from payment of the State gasoline tax. Passed in anticipation of carbonization of Utah coal, the law at present has no practical application.

Organized labor sponsored a bill to set up miners' examining boards in each coal county, one operator representative and two miners to compose each board. Each applicant for a permit to work would be required to give oral answers to twelve questions to determine his fitness. A fee of $2 would be required with each permit.

Stoker Sales Again Show Gain

Sales of coal-burning stokers in January, 1935, totaled 1,588, of which 1,241 were small residential size units, according to statistics furnished the U. S. Bureau of Census by 108 manufacturers. This compares with sales of 977 units in January, 1934, and 551 for the corresponding month of 1933. Revised figures for 1934 by 108 manufacturers—former reports covered only 83—show that 28,704 units of all sizes and types were sold, compared with 18,233 in 1933. Sales by classes in 1934 were as follows: Residential (under 100 lb. of coal per hour), 23,214; apartment houses and small commercial heating jobs (100 to 200 lb. per hour), 2,282; general commercial heating and small high-pressure steam plants (200 to 300 lb. per hour), 1,078; large commercial and high-pressure steam plants (over 300 lb. per hour), 2,130.

Industrial Notes

GEORGE H. BUCHER has been elected a vice-president of the Westinghouse Electric & Manufacturing Co., of East Pittsburgh, Pa., and will make his headquarters in New York.

B. E. SCHONTHAL & CO., INC., Chicago, announce the removal of their offices to 28 East Jackson Boulevard.

READING IRON CO., Reading Pa., has organized a commercial research department to aid buyers in selecting the correct kinds of pipe for various purposes.

B. D. CHRISTIAN, general sales manager, Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., has been elected vice-president of the company.

NATIONAL ALLOY STEEL CO., Blawnox, Pa., has appointed Horace T. Potts Co., Erie Ave. and D St., Philadelphia, Pa., as district representative in the Philadelphia and Baltimore (Md.) territories for the sale of heat-, corrosion- and abrasion-resisting castings.

LINDROOTH, SHUBART & CO., Denver, Colo., announces a change in name to SHUBART & SCHLOSS. STANLEY C. SHUBART, for seven years associated with the Detroit (Mich.) office of the Link-Belt Co., has joined the Shubart & Schloss organization as Rocky Mountain representative.

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Operators Reply to Union Wage Demands in Appalachian Field

Left to right at speakers' table are A. J. Musser, vice-president, Clearfield Bituminous Coal Corporation; Duncan C. Kennedy, Kanawha Coal Operators' Association, and Charles O'Neill, president, Eastern Bituminous Coal Association.

Conference Debates New Appalachian Pact; Anthracite Miners Jailed for Contempt

WASHINGTON, D. C., March 23—Negotiations for a wage agreement in the Appalachian field to take the place of the pact that expires March 31 continued to hold the center of the stage in labor affairs during the past month. The operators and miners have chosen representatives on the joint scale committee, and a subcommittee of sixteen was named on March 22 to begin detailed work on drafting a contract.

A negative reply to the United Mine Workers' proposal of Feb. 18 for a 6-hour day, 5-day week and increased wages was presented for the operators on Feb. 20 by W. A. Richards, president, Ashland Coal & Coke Co. The union proposals were flatly rejected in a statement pointing out that mounting production costs in recent years, especially under the 7-hour day, made compliance with the proposals impossible. In Division I, for instance, it was shown that in April, May and June, 1934, the wage cost was $1.15 per ton, compared with a pre-code cost of 65c., representing an increase of $125,500,000 on the 251,000,000 tons produced in that division last year. In addition to this increase in earnings by the miners, the statement stressed the 27 per cent reduction in working time, with 92 per cent of the miners unionized.

Referring to the prediction by John L. Lewis, president, United Mine Workers, that reducing the workday from seven to six hours, with wage increases, would cost only 22c. per ton, the operators recalled the predicted cost of changing from eight to seven hours a year ago. Union representatives at that time stated that the change would cause an increase of 12c. per ton, but even the operators' estimate of 17 to 25c. fell short of the actual figure, which was 29.48c. per ton, as shown by NRA figures. Furthermore, realization in Division I between November, 1933, and March, 1934, under the 8-hour day, was $1.6311, with a cost of $1.6008, or a profit of 3.03c. per ton, compared with realization of $1.9419; cost, $1.8956, and a loss of 5.4c. per ton in April, May and June, 1934, under the 7-hour day.

The operators estimated that the miners' proposals would increase Division 1 costs 45c. per ton, and, since the producers are operating at a loss, they asserted that they cannot pay it. In any event, it was held that the increase in cost that would be caused by lopping another hour from the workday would enable substitutes to make further inroads on the national energy market and so increase unemployment in the bituminous industry. Between 1923 and 1933, it was shown, the percentage of bituminous coal in the energy market fell from 60.5 to 45.3; anthracite, from 10.4 to 7.0; whereas petroleum rose from 20.0 to 29.1; natural gas, from 4.5 to 8.6; and water power, from 4.6 to 10.0.

Mr. Lewis commented facetiously on the operators' statement, contending that the lowered realization by the industry was the fault of the operators. "We have tried to prevent you from selling coal below cost," he said, "and we want you to make a fair return on your investment." He also pointed out that figures for summer instead of winter were cited. In regard to competitive fuels, he said he believed that before long we will reach the point where hydro-electricity will not seriously compete with coal. He also asserted that the oil industry was striving to put its house in order and expected higher fuel-oil prices as a result of government efforts at regulation. The administration, he said, had promised to regulate natural gas and fix competition so as to help the coal industry.

When the conference reconvened on Feb. 21, Mr. Richards offered a resolution to renew the present agreements for another year, with provision for inclusion of any arrangement that might be made for elimination of inequitable differentials, both in and between districts. Another provision was that "if the number of hours per day and/or the number of hours per week are changed by legislative action, the present hourly and piecework rate shall remain in effect, and there shall be no suspension of work during negotiations for a new agreement."

In reply to a question by Mr. Lewis as to why the operators desired to renew the old contract, Mr. Richards said that because of pending legislation, the operators would be better able to determine a course of action later. They also wanted to examine more carefully the miners' proposals. Thereupon Mr. Lewis agreed to give careful consideration to the operators' suggestion and agreed to a recess until March 11.

At the March 11 conference, Charles O'Neill, president, Central Pennsylvania Coal Producers' Association, reiterated the contention of the operators that it would be impossible to meet the union proposals because of the increased cost of production. He answered Mr. Lewis' charge that the figures given were seasonal with data to the effect that if the figures were carried through from April to the end of 1934 the loss to the industry would exceed $3,000,000 per year. He cited numerous instances of coal displacement by natural gas, as well as oil, and decried the government's huge hydro-electric projects, emphasizing a statement at the recent A.I.M.E. meeting that these projects would displace 116,000,000 tons of coal annually and put 120,000 miners out of work. Compliance with the union's demands probably would result in an annual shrinkage of 100,000,000 tons.

When Mr. Lewis asked a vote by hands from union representatives on the operators' resolution to extend the old agreement, opposition was unanimous. He stated that the union was fully aware of the com-

petitive situation, but that it was not sufficient to warrant the operators in rejecting proposals which he contended were designed to stabilize the bituminous industry. To "separate chiselers from non-chiselers," he offered the following amendment to the union wage proposals:

> That the ensuing agreement to be negotiated by this conference contain a provision stipulating that all signatories to said agreement agree and covenant to respect and adhere to the provisions of the Code of Fair Competition for the Bituminous Industry, or such supplemental rules, regulations or laws as may be enacted by the 74th Congress for the government of said bituminous industry.

The sessions on March 13 and 14 were largely devoted to efforts to iron out differences among the operators in choosing a scale committee to carry on detailed negotiations. These differences revolved around deciding whether northern West Virginia should vote with the northern or southern operators. As the northern West Virginia group had withdrawn from the northern camp at last year's wage conferences, some of the latter suspected a secret alliance and were opposed to having the voting strength of the North "curtailed." Practically all the operators pleaded for harmony, but for a while an impasse seemed to have been reached. A solution was found at the March 15 session, when Mr. O'Neill presented the following motion, which was seconded by Mr. Murray and unanimously adopted:

> It is moved that the joint scale committee be set up with equal voting power as between northern and southern districts outside of northern West Virginia; that northern West Virginia be given representation on the scale committee but with the understanding that on all votes northern West Virginia shall be polled last; that in the event of a tie vote between the northern operators and southern operators, then northern West Virginia shall not vote nor record any opinion on the issue then under consideration; provided that northern West Virginia shall be entitled to vote and have its vote recorded and counted on all matters pertaining exclusively to the northern West Virginia district whether a tie vote exists or not; provided, further, that this shall be adopted as a rule of this convention, but that nothing herein contained shall affect the unit rule already adopted by the convention.

The following scale committee was named by the operators:

Northern West Virginia—A. C. Beeson, ancillary receiver, Consolidation Coal Co., and S. D. Brady, Jr., president, Osage Coal Co.; *eastern and central Pennsylvania and Maryland*—Mr. O'Neill; L. W. Householder, vice-president, Rochester & Pittsburgh Coal Co.; J. William Wetter, vice-president, Madeira Hill Coal Mining Co., and A. B. Stewart, president, Davis Coal & Coke Co.; *western Pennsylvania*—J. D. A. Morrow, president, Pittsburgh Coal Co.; R. E. Jamison, sales manager, Jamison Coal & Coke Co.; Scott Stewart, president, W. J. Rainey, Inc., and W. L. Affelder, vice-president, Hillman Coal & Coke Co.; *Ohio, West Virginia Panhandle and Michigan*—W. L. Robison, president, Youghiogheny & Ohio Coal Co.; William Emery, Jr., president, Cambridge Collieries Co.; R. L. Ireland, Jr., vice-president, Hanna Coal Co., and E. H. Davis, president, Rock Lick Smokeless Coal Co.; *southern low-volatile*—P. P. Kerr, general superintendent, New River & Pocahontas Consolidated Coal Co.; L. T. Putnam, general superintendent, Raleigh-Wyoming Mining Co.; Edward Graff, general manager, New River Co.; J. Wade Bell, general manager, Imperial Smokeless Coal Co., and M. L. Garvey, Pocahontas Fuel Co.; *southern high-volatile*—E. R. Price, superintendent, Inland Steel Co.; W. E. Davis, president, Old King Mining Co.; L. E. Woods, president, Crystal Block Coal & Coke Co.; J. D. Francis, president, Island Creek Coal Co.; R. E. Taggart, vice-president, Stonega Coke & Coal Co.; L. C. Gunter, executive vice-president, Southern Appalachian Coal Operators' Association; N. B. Perkins, president, Perkins-Bowling Coal Co., and D. H. Morton, president, Winifrede Collieries.

Representatives of the mine workers on the scale committee are as follows:

International Union—Messrs. Lewis, Murray and Thomas Kennedy; *District 2* (Central Pennsylvania)—James Mark and John Ghizzoni; *District 3* (Greensburg, Pa.)—Frank Hughes and George Smith; *District 4* (Uniontown, Pa.)—William Hynes and Art Hall; *District 5* (western Pennsylvania) — P. T. Fagan and William Hargest; *District 6* (Ohio) — Percy Tetlow and G. W. Savage; *District 16* (Maryland)—John T. Jones; *District 17* (southern West Virginia)—Van A. Bittner, William Blizzard and G. W. White; *District 19* (Tennessee-Kentucky) — William Turnblazer, Bud Carr and George Bramon; *District 24* (Michigan) — Frank O'Donnell; *District 28* (Virginia)—John Saxton, William Minton and L. V. Hobson; *District 30* (Kentucky)—Sam Caddy, James J. McAndrew and John Stines.

The joint scale committee of operators and mine workers held regular meetings beginning March 18, but failed to settle any questions of moment. A spokesman from each district is to state its case with respect to differentials involving freight rates as well as wages, with data and statistics.

A climax to the long series of picketing riots, shooting affrays and court actions in the struggle for supremacy between the United Mine Workers and the United Anthracite Miners in the anthracite field was reached March 16, when 29 officers of the new union were jailed at Wilkes-Barre, Pa., for contempt of court. Judge W. A. Valentine sentenced them for refusal to rescind a strike call at the Glen Alden Coal Co., as decreed in an injunction issued Feb. 16. The prisoners were locked up in the county prison until they shall have complied with the court's order.

A federal and State round-up of suspects in connection with the series of coal-train bombings in southern Illinois, which began late in February, continued during the second week of March. Deputy Attorney-General Emory J. Smith, of Chicago, with a corps of investigators, is conducting an inquiry at Harrisburg, Ill. A civil suit for $200,000 damages against the Progressive Miners recites such acts of violence as: assaults with clubs, stones, blackjacks; stabbing, shooting; bombing of churches, homes, railroads, stores, bridges, fan houses; arson and murder. The warfare between the new and old unions in the last two years has exacted a toll of 26 lives and injured more than 200 persons.

The commission appointed by Governor Ruby Laffoon of Kentucky has been holding hearings in its investigation of the "state of unrest" in the Harlan field. Union officials and miners alleged that they were beaten, intimidated and otherwise molested by mine guards seeking to prevent union organization work. Counter-charges by operators' attorneys were to the effect that union miners had abused non-union workers for refusing to enlist in the union ranks.

Mine Death Rate Lower

Coal-mine accidents caused the deaths of 69 bituminous and 37 anthracite miners in January, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. This compares with 85 bituminous and 20 anthracite fatalities in December, and 63 bituminous and 26 anthracite deaths in January, 1934. With a production of 35,932,000 tons, the bituminous death rate in January was 1.92 per million tons, against 2.71 in December, when 31,386,000 tons was mined, and 1.91 in January, 1934, in mining 32,916,000 tons. The anthracite fatality rate was 6.46 per million tons in January, based on an output of 5,724,000 tons. In December, the rate was 4.25 in producing 4,705,000 tons, while in January, 1934, the rate was 4.24. For the two industries combined the death rate in January was 2.54 per million tons, against 2.91 in December and 2.28 in January, 1934.

Armco Mine to Resume

Operations at the coal mine of the American Rolling Mill Co. at Marting, Fayette County, W. Va., are to be resumed soon, according to an announcement on Feb. 21 by C. W. Connor, superintendent of the company's mine at Nellis, W. Va. The Marting operation, which has been idle since 1928, is expected to give employment to 250 men.

Coal-Test Methods Approved

At the meeting of Committee D-5, on coal and coke, of the American Society for Testing Materials held in Philadelphia, Pa., March 4-8, the following methods of test were approved for presentation to the society next June, subject to the usual letter ballot vote of the committee: method of test for screen analysis of coal, test for grindability of coal by Hardgrove-machine method, and test for grindability by ball-mill method.

Coal—Heating Committees

John C. Cosgrove, chairman, Committee of Ten—Coal and Heating Industries, announces the appointment of standing committees for the ensuing year, as follows: Ways and means—Lyle H. Dayhoff (chairman), H. H. Kurtz and C. M. Terry; joint service—Harry M. Hart (chairman), M. E. Robinson, Jr., Jack Stowell, R. C. Goddard and J. Harvey Manny; publications—H. R. Linn (chairman), R. A. Miller and C. M. Terry; research—J. H. Walker (chairman), T. A. Marsh, Paul E. Holcombe, Olaf Jacobson and J. G. Bently; standards of products and practices—J. Harvey Manny, H. H. Kurtz, Ben L. Boalt and Homer R. Linn.

"Bootleg" Dismissal Upheld

The right of coal operators to discharge employees for engaging in and aiding others in "bootleg" mining was upheld in a decision March 1 by James A. Gorman, umpire of the Anthracite Conciliation Board. The decision was in the case of a grievance filed by a miner discharged by the Alliance Coal Co., near Tamaqua, Pa., alleged to have aided a brother in "bootlegging" coal. Umpire Gorman ruled that "the complainant has no standing before either the board of conciliation or the umpire if, by reason of his participation in such an act of disloyalty to both the employers and fellow employees, he finds himself out of work."

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Safety Cap

Mine Safety Appliances Co., Pittsburgh, Pa., now offers the "ComfO Cap" for head protection. Resembling the old-style

miner's cap, both in appearance and exceptional easy-fitting comfort, the new cap also is said to possess the desirable protective qualities distinguishing all MSA "Skullgards." The cap is molded in one piece from durable black micarta and is reinforced in the top of the crown by a completely insulated metal screen and ribbed construction, and at the base by an integrally molded tape that extends into the peak of the cap. The peak is sufficiently long to shield the wearer's eyes from the light of other lamps, the company points out, and gives added protection to the face and eyes from falling and flying material. The lamp-holder base is an integral part of the crown and is provided with a metal clip for the Edison cap lamp as standard equipment. A special holder is available for other types of lamps upon specification.

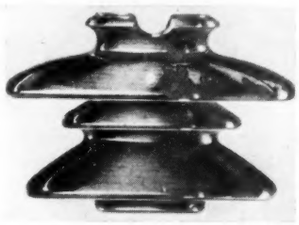
The new cap is a non-conductor of electricity and, it is stated, is immune to softening by mine water or perspiration. It is available in one-eighth sizes from 6 to 7¾ inclusive and is supplied with a renewable sweatband of uncushioned leatherette or genuine leather, as desired. An adjustable hammock of strong webbing cushions the wearer's head and absorbs and distributes the shock of blows on the crown. Self-ventilation is provided by holes in the crown and space around the sweatband.

Resurfacer

For repairing within 36 hours, it is asserted, concrete, wood, brick, asphalt or composition floors that have become rutted, rough or broken, Stonhard "Resurfacer" is offered by the Stonhard Co., 401 North Broad St., Philadelphia, Pa. According to the company, the material can be applied with a trowel without extensive preparation, and provides a tough, resilient, dust- and water-proof non-skid surface.

Insulator

To meet the demand for a one-piece pin-type insulator equivalent in size and electrical values to comparable insulators normally used on transmission lines of from 22 to 46 kv., Ohio Brass Co., Mansfield, Ohio, offers three "O-B Uni-Part"

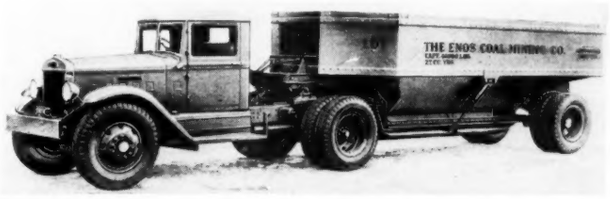


insulators Nos. 31546, 31622 and 31623. These insulators, the manufacturer states, are exceptionally strong and are especially adapted for use on line locations where replacements are heavy because of breakage due to shooting, stone-throwing or mechanical impacts.

Trail Cars

A new line of trail cars in 8- to 25-ton sizes for handling coal and other materials of heavy weight and bulk has been announced by the Austin-Western Road Machinery Co., Aurora, Ill. Engineered for maximum payload, says the company, these cars (on rubber ties) have features similar to those employed by recognized builders of railroad dump cars. Equipped with bottom- or side-dump doors that operate by air, hydraulic or mechanical (manual) controls, these trail cars come in three standard body designs, including special built-to-order constructions.

According to the manufacturer, these trail cars will haul more than double the load a truck-tractor can carry on its chassis. Features include a full-universal gravity-cushioned fifth wheel for rough-surface travel without strain or distortion; generous ground clearance for easy dumping; low over-all height for quick, convenient loading; dumping controlled by truck driver from cab; short turning radius with ample clearance; massive semi-elliptical springs mounted directly under center sills; automatic safety dumping devices, etc.



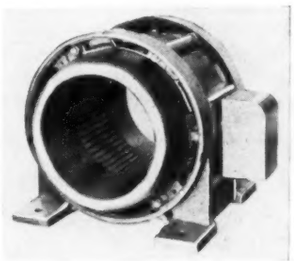
Valves

A new line of renewable bronze angle and globe valves has been placed on the market by the Fairbanks Co., 393 Lafayette St., New York, which points out the following features: radial seat between body and bonnet insures a tight joint and perfect alignment of all parts, thus decreasing wear (this seat is drawn to a tight joint by the union nut without sliding or scraping, increasing valve life and assuring a tight body joint after every assembly); disk ring of long-fiber asbestos compounded with vulcanizing elements and specially cured serves efficiently not only for the control of steam but also hot and cold water; disk holder made with standard dimensions, thus allowing use of other makes of disk rings, if desired; rolled-rod bronze stem, at least five threads always in contact with the bonnet; heavy bronze union nut with large hexes to provide a firm wrench grip and permit removal of bonnet with less risk of damage; protected top seat above the stem threads for greater assurance of a clean, tight joint when the valve is

fully opened for repacking under pressure; ventilated malleable-iron handwheel for a firm, cool grip. All parts of globe and angle valves are interchangeable.

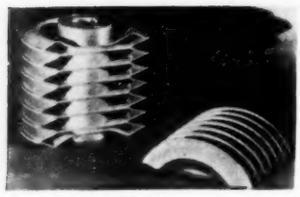
Seal-Clad Motor

Open-type construction with permanent coil protection are the major features cited for the new "Seal-Clad" squirrel-cage motors introduced by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Hard, smooth Bakelite shields are sealed over the sta-



tor coils to protect them against metallic dust, grit, oil, moisture, mild acids and other agents injurious to insulation. These motors are built in ratings up to 25 hp., 1,800 r.p.m., and are suited to a much broader range of application than the ordinary open-type motor, the maker declares.

A new reinforced steel sheave also has been developed by the Texrope division of Allis-Chalmers, and has been given the designation of the "Duro-Brace Texsteel Sheave." Outside walls are reinforced with a heavy convex steel plate which



strengthens these vulnerable areas to such a degree as practically to eliminate the possibility of distortion, irrespective of the strains to which they are subjected, according to the company. Welding at the rim and web for additional strength and interior grid-type construction have been retained.

Rising-Stem Valve

Kennedy Valve Mfg. Co., Elmira, N. Y., announces the Fig. 45 line of rising-stem, heavy standard bronze gate valves for 150-lb. per-square-inch working steam pressure and 250-lb. water, oil or gas pressure. Features noted by the company include: operating mechanism employing solid-wedge disks which are simple, heavily proportioned, accurately machined and without small, quick-wearing parts; flexible connection between disk and stem to prevent binding or springing of the stem in closing the valve; high tensile and torsional strength bronze-composition stem with a large number of contact threads in the bonnet; extra large bonnet connection close to the body to prevent distortion when the wrench is applied; deep stuffing box with gland and square-section molded packing rings; large non-heating malleable-iron handwheel secured to the stem by a nut; and heavy, wide pipe-end hexagons with plenty of threads.

Safety Car Retainer

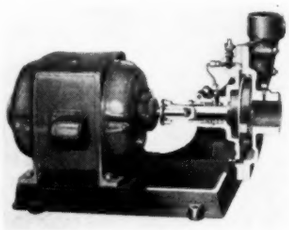
Safety First Supply Co., Pittsburgh, Pa., offers a new safety car retainer which it points out is both safe and positive in action and can be attached or removed quickly.

The retainer consists of a base channeled to fit over a 6-in. tie and contoured at one end to engage the ball, web and base of the rail. Pivoted to a standard integral with the base is the head, which acts as the wheel retainer. This head is provided with a lip which fits over the inner side of the ball of the rail. By using a pipe or bar in the shank, the head is tilted sufficiently to back off the wheel, thus releasing the retainer from the rail.

The retainer, according to the company, can be attached or removed in two seconds. The head, while of ample strength to hold the car, is not required to do so, as it is contoured to deflect the wheels toward the opposite rail, the resultant wedging action locking the car in place. Gripping the rail in five places, the retainer is not subject to slippage, it is said, and the design is such that the grip increases with the pressure. Sizes are available for rails from 16 to 60 lb.; larger sizes on specification.

Close-Coupled Pump

Deming Co., Salem, Ohio, is now marketing a new line of close-coupled side-suction centrifugal pumping units, designated as "Standard-Motormount Units." The outstanding feature of the line, according to the company, is the fact that any standard ball-bearing motor of the open, inclosed, splash-proof or explosion-proof type can be used. Also, a special connection for the motor and pump shafts eliminates the



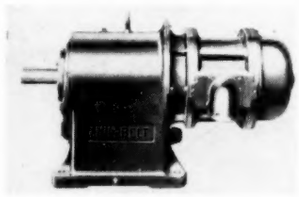
necessity for special motors, bells and shafts. Pump and motor are mounted on a substantial baseplate to eliminate any unbalanced overhang, and the cradle mounting of the pump, it is stated, permits expansion when handling hot liquids without disturbing the alignment of the unit. Complete units are carried in stock.

Lubricating Unit

Lubrication Products Co., Burgettstown, Pa., now offers "Stapax," a self-contained lubrication for all types of journal boxes, said to eliminate the need for waste packing. Features noted by the manufacturer include: positive spring action which, together with the capillary attraction introduced by its felt pad, applies lubrication throughout the length of the bearing without loss of oil or excess oil in the journal box; and availability in both standard and special sizes.

Motorized Reducers

Link-Belt Co., Philadelphia, Pa., offers a new line of motorized helical-gear reducers featured by unusually accessible motor and high-speed gears to meet requirements of greater compactness and economy in self-contained, inclosed speed-reducing units. In the new unit, a standard round-frame motor



conforming to NEMA specifications is secured to the side of the reducer housing by means of an adapter casting, which supports the motor shaft in oversize anti-friction bearings close to the pinion, thus, it is stated, assuring good alignment and proper meshing of the pinion with its mate. The complete motor, with adapter and motor pinion, may be removed as a unit without disturbing the alignment of the motor or of the gears remaining in the reducer housing. In fact, the maker points out, the motor gear and pinion can be removed without disconnecting the driven machine or the low-speed gears. The new reducers may be mounted on the floor, ceiling or wall, and are available in double reduction for ½ to 75 hp. in ratios up to 38½ to 1, and in triple reduction, up to 30 hp., ratios up to 292 to 1.

Stripping Shovel

Bucyrus-Erie Co., South Milwaukee, Wis., has announced the 950-B 14- to 22-cu.yd. stripping shovel, which it points out is readily convertible to dragline operation. Features noted by the company include: individual motor drive for the four caterpillar units (giving variable speeds for turning) and hydraulic steering to reduce stresses by minimizing slewing of units and skidding of belts; hydraulic leveling, with enough power to level the machine while digging, thus increasing effective loading time where irregular seams are encountered; hydraulic jacks are mounted to minimize the possibility of plungers cramping in cylinders and to protect the corners of the base against torsional loads; boom suspension removes all excessive loads from the boom at the shipper shaft, thus reducing stresses while swinging; counterbalanced hoist reduces power peaks; and twin single-part hoists hold the dipper steady in heavy digging and result in high over-all efficiency from the main motors to the dipper. The 950-B machine is available with booms up to 100 ft. long, dipper handles up to 70 ft. long, and dipper capacities from 14 up to 22 cu.yd.

Bucyrus-Erie also announces the Models 26-P (caterpillar-mounted) and 33-P (wheel mounted) prospecting drills, both equipped with a 20-hp., 4-cylinder, heavy-duty gasoline or a 25-hp. oil engine, with power take-off shaft mounted in ball bearings. Both are equipped with a telescopic derrick for convenience in moving.

An additional product of the company is the Bucyrus-Armstrong 29-T blast-hole drill, a caterpillar-mounted machine for which the company claims a substantial increase in tonnage. Frame dimensions are: over-all length, 16 ft.; width, including overhang of belt housing, 8 ft. 3 in.; machine height, with derrick (38 ft. from ground to sheave center) down, 10 ft. 8 in. Shipping weight is approximately 21,850 lb., and either a 40-hp., 6-cylinder, heavy-duty gasoline engine with reversing transmission or a 20-hp. reversing-type variable-speed electric motor is available for power.

26-P Prospecting Drill